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A Revision of the Subgenus *Evylaeus* of the Genus *Lasioglossum* in Japan (Hymenoptera, Halictidae) Part I

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Abstract. This paper presents a revisional study of the subgenus *Evylaeus* of the genus *Lasioglossum* in Japan. We propose a system of species-group classification based on Japanese *Evylaeus* as follows: 1) the carinate-*Evylaeus* superspecies-group is divided into five species-groups and two species-subgroups; 2) the carinaless-*Evylaeus* superspecies-group is divided into 11 species-groups and two species-subgroups.

In this paper (Part I), the carinate-*Evylaeus* superspecies-group is treated. It contains 18 species. The specimens that have been misidentified as *Lasioglossum (Evylaeus) vulsum* (Vachal) in Japan are classified as *L. (E.) hoffmanni* (Strand). A lectotype is designated for *L. (E.) hoffmanni*. The male of *L. (E.) naitoi* Ebmer et Maeta is described for the first time. Seven species are recorded from the following localities for the first time: *L. (E.) affine* (Smith), *L. (E.) apristum* (Vachal), *L. (E.) duplex* (Dalla Torre), *L. (E.) hoffmanni* (Strand) and *L. (E.) sibiriacum* (Blüthgen) from South Korea; *L. (E.) nipponense* (Hirashima) from Taiwan; and *L. (E.) percrassiceps* (Cockerell) from South Korea and Taiwan.

All of the Japanese species of the carinate-*Evylaeus* superspecies-group are re-described or provided with a supplementary description with photographs, illustrations and SEM photographs of important characters. Keys to both sexes of the Japanese species of this group are provided. Remarks and diagnoses on concerning taxonomy, geographical distribution, flight and flower records, social structure, and biological references for each species are given.

Key words: Hymenoptera, Halictidae, Halictinae, Halictini, *Lasioglossum*, *Evylaeus*, carinate-*Evylaeus* superspecies-group, revision, Japan.

Introduction

The subgenus *Evylaeus* Robertson belongs to the genus *Lasioglossum* Curtis of the subfamily Halictinae, and is one of the most diversified subgenera of the family Halictidae. Robertson erected this taxon as the genus *Evylaeus* in 1902 based on the type species of *Halictus arcuatus* Robertson. Michener (1944) then relegated the genus *Evylaeus* to subgeneric status under the genus *Lasioglossum*. However, some researchers have dealt with the status of *Evylaeus* at the genus level (Moure & Hurd, 1987; Pesenko, 2000; Pesenko *et al.*, 2000). In recent years, Palaearctic species belonging to the genus *Evylaeus* were divided into 29 subgenera by Pesenko (2007). In this study, we retain the status of *Evylaeus* at the subgenus level under the genus *Lasioglossum*, in accordance with Ebmer (1987).

This subgenus is known from all the continents, excluding Australia and Antarctica. So far, about 400 species are known from these regions (Pesenko, 2007). They are especially numerous in the Holarctic Region and many are transpalaearctic. However, the taxonomy at the species-level has been poorly studied and many undescribed species from around the world may need to added to this bee fauna.

The genus *Lasioglossum* has been historically con-

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sidered one of the model taxa for studying the evolutionary origins of eusocial behavior (Michener, 1974), because at least two subgenera contain both solitary and eusocial members: *Dialictus* Robertson*, Evylaeus* and a part of *Lasioglossum* (s. str.). In particular, the subgenus *Evylaeus* exhibits the widest range of social behaviors for any insect taxon of equivalent rank (Packer, 1991). It is suggested that *Evylaeus* is an ideal group for studying the evolutionary pattern of social behavior in the genus *Lasioglossum*.

Many *Evylaeus* species are polylectic, and visit many flowering plants from early spring to late autumn. *Evylaeus* exhibits a harmonious predominance both in the number of species and individuals in temperate zones. Thus, they represent important pollinators of many flowering plants in these regions. In recent years, *L. (E.) villosulum trichopse* (Strand) has been studied for use as a pollinator for hybrid seed production of lettuce (Goubara & Takasaki, 2003, 2004).

In spite of its importance for sociobiology, and pollination systems, *Evylaeus* has not been satisfactorily studied in Japan. From Japan, 46 species of the subgenus have been fragmentarily described and recorded. They are often extremely difficult to identify due to the lack of an adequate identification system for Japanese *Evylaeus* and the presence of a considerable number of undescribed or unrecorded species.

The purpose of this study is to revise the Japanese *Evylaeus* as follows: 1) clarify the Japanese fauna; 2) re-describe or provide supplementary descriptions for previously described species from Japan; 3) propose a taxonomic system of the species-group in Japan; 4) provide identification keys for both sexes; and 5) summarize biological information such as social structure, flight and flower records for each species.

Historical review of the study of Japanese *Evylaeus*

The following list indicates the history of study of Japanese species in the subgenus *Evylaeus*. Nomenclatural changes are detailed in the synonymic list for each species.

1866. Motschulsky described *Halictus unicolor* from Japan.

1873. Smith described *H. tarsatus* from Japan (Honshu).

1879. Smith described *H. familiaris* from Japan (Hokkaido).

1896. Dalla Torre recorded *H. japonicus* from Japan for the first time.

1903. Vachal described five species from Japan: *H. apristus*, *H. leoninus*, *H. taeniolellus*, *H. trispinis*, *H. vulsus*.

1905. Pérez described two species from Japan: *H. angularis*, *H. rimalis*.

1910. Strand described two species from Japan: *H. nagasakiensis*, *H. subfamiliaris*.

1912. Matsumura described *Sphecodes pallidulus* from Japan.

1924. Blüthgen recorded *H. sibiriacus* from Japan for the first time.

1925. Blüthgen described *H. kankaucharis* from Japan (Honshu).

1953. Hirashima described *H. nipponensis* from Japan (Shikoku).

1966. Hirashima & Sakagami described *Lasioglossum (Evylaeus) ohei* from Japan (Hokkaido).

1972. Sakagami & Fukuda recorded two species from Japan (Hokkaido) for the first time: *L. (E.) albipes*, *L. (E.) calceatum*.

1976. Usui, Nishijima, Fukuda & Sakagami recorded four species from Japan (Hokkaido) for the first time: *L. (E.) villosulum* ssp., *L. (E.) baleicum*, *L. (Dialictus) problematicum*, *L. (E.) kiautshouense*.

1977. Svensson, Ebmer & Sakagami described *L. (E.) boreale* from Japan (Hokkaido) and Sweden.

1982. Sakagami, Ebmer, Matsumura & Maeta recorded *L. (E.) sakagamii* from Japan (Hokkaido and Honshu) for the first time.

1985. Ebmer & Sakagami described two species: *L. (E.) allodalum* from Japan (Hokkaido and Honshu); *L. (E.) hirashimae* from Japan (Honshu and Kyushu).

1988. Sakagami described *L. (E.) nupricola* from Japan (Hokkaido and Honshu) and Russian Far East (Kurile Islands).

1988. Ebmer recorded *L. (E.) politum pekingense* from Japan for the first time.

1989. Tadauchi listed 23 species in the checklist of Japanese Insects.

1990. Ebmer & Sakagami recorded *L. (E.) algirum pseudannulipes* from Japan (Hokkaido) for the first time.

1993. Takahashi & Sakagami described *L. (E.) kuroshio* from Japan (Izu Islands). In addition, they recorded two species from Japan (Izu Islands) for the first time: *L. (E.) pallilomum*, *L. (E.) simplicior*.

1994. Ebmer & Sakagami described four species: *L. (E.) amamiense*, *L. (E.) smilodon*, *L. (E.) zipangu* from Japan (Ryukyus); *L. (E.) virideglaucum* from Japan (Honshu and Ryukyus) and China.

1994. Ebmer & Maeta described two species from Japan

(Ryukyus): *L. (E.) naitoi*, *L. (E.) solisortus*.

1994. Sakagami, Miyanaga & Maeta described *L. (E.) subtropicum* from Japan (Ryukyus).

1995. Sakagami & Tadauchi described four species: *L. (E.) longifacies* from Japan (Hokkaido and Honshu) and Russian Far East (Kurile Islands); *L. (E.) pumilum*, *L. (E.) sphecodicolor* and *L. (E.) zunaga* from Japan (Hokkaido and Honshu).

1996. Sakagami & Ebmer described *L. (E.) frigidum* from Japan (Hokkaido and Honshu).

2002. Goubara, Sugimoto, Miyanaga & Maeta listed 42 described species in the checklist of distribution records of Japanese halictine bees.

2006. Murao, Ebmer & Tadauchi described three species: *L. (E.) caliginosum* from Japan (Hokkaido, Honshu, Shikoku and Kyushu) and Russian Far East (Primorsky); *L. (E.) miyabei* from Japan (Hokkaido, Honshu, Shikoku, Kyushu and Ryukyus) and Russian Far East (Primorsky); *L. (E.) yamanei* from Japan (Honshu, Shikoku and Kyushu). In addition, they reconfirmed the synonymy of *L. (E.) vulsum* with *L. (E.) trispine*.

2006. Murao & Tadauchi described *L. (E.) latilabrum* from Japan (Ryukyus).

Materials and methods

Materials

This study is based on the examination of about ten thousands specimens of the subgenus *Evylaeus* from Ja-

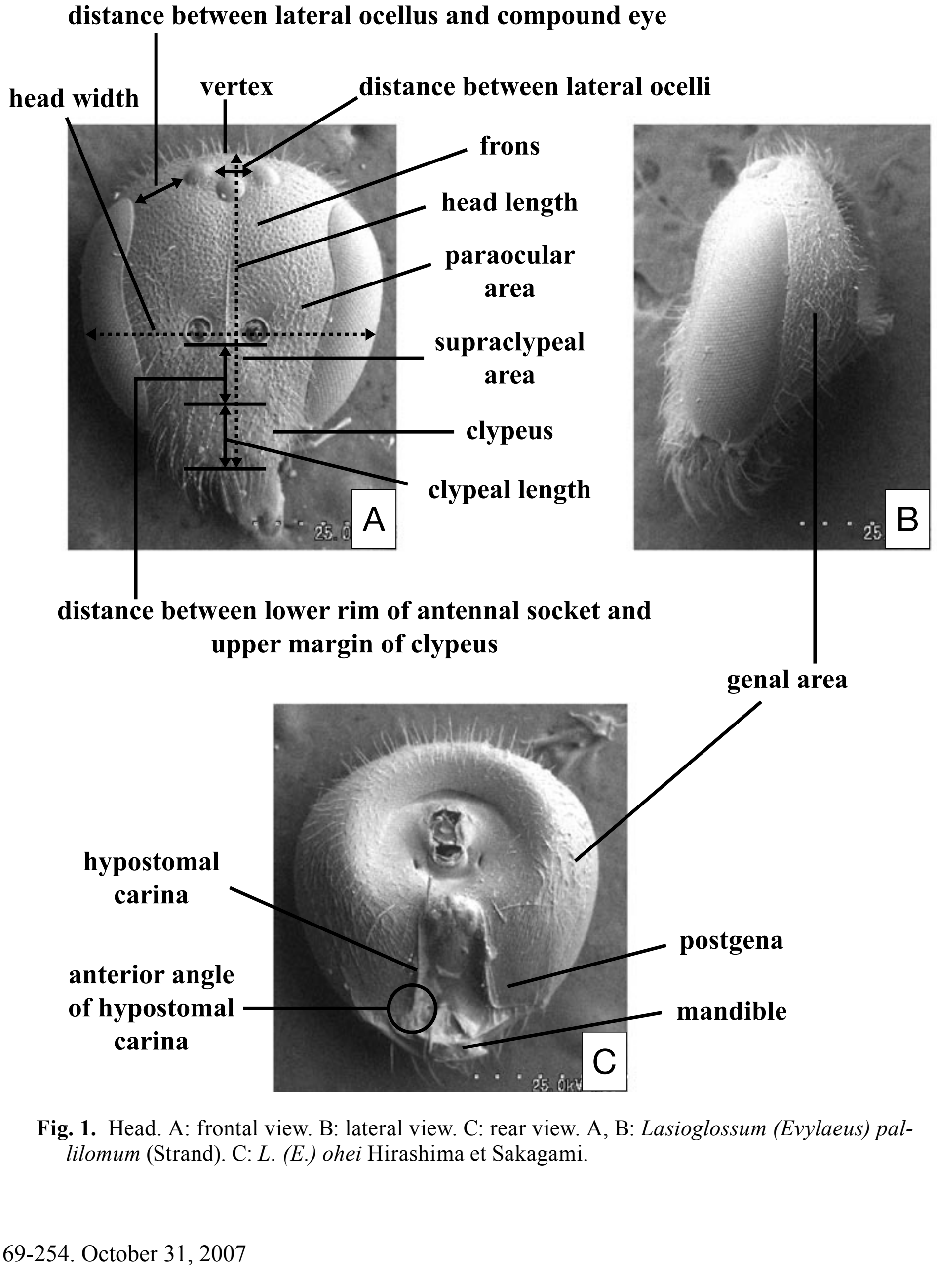
distance between lateral ocellus and compound eye
head width
vertex
distance between lateral ocelli
frons
head length
paraocular area
supraclypeal area
clypeus
clypeal length
A
B
distance between lower rim of antennal socket and upper margin of clypeus
genal area
hypostomal carina
postgena
anterior angle of hypostomal carina
mandible
C

Fig. 1. Head. A: frontal view. B: lateral view. C: rear view. A, B: *Lasioglossum (Evylaeus) pallilomum* (Strand). C: *L. (E.) ohei* Hirashima et Sakagami.

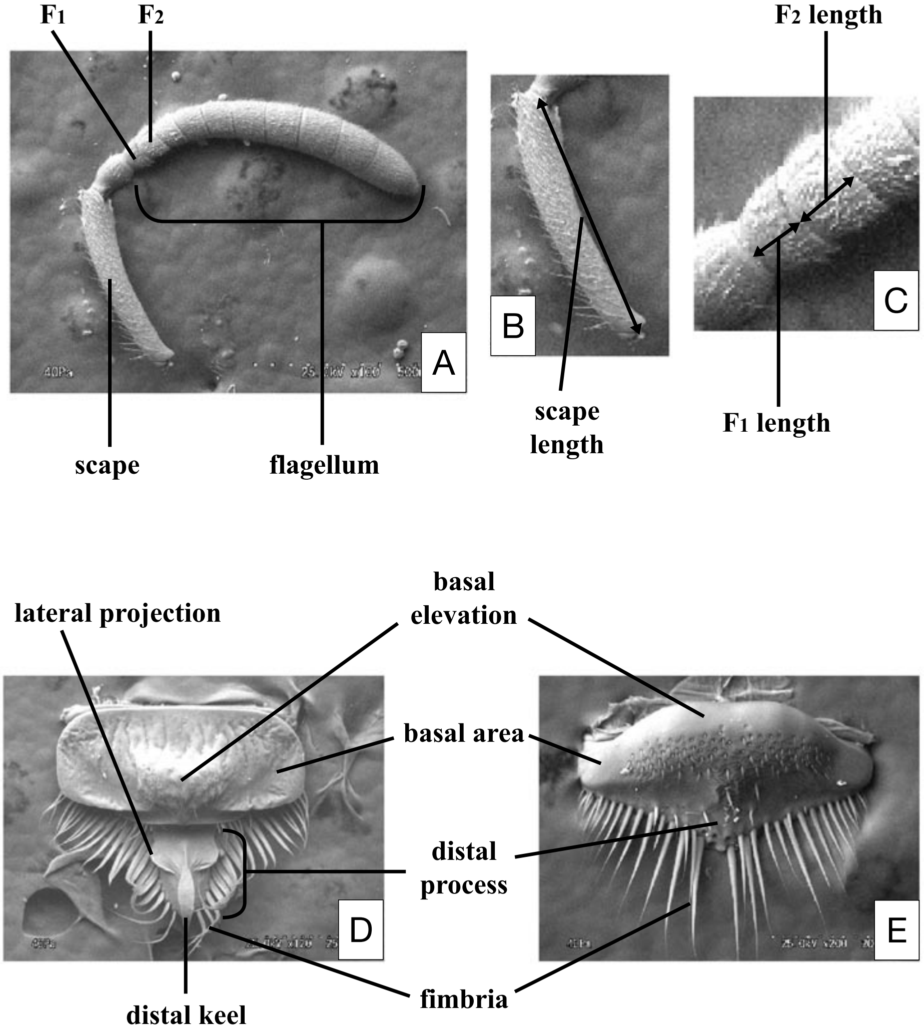

Fig. 2. A-C: antenna, *Lasioglossum (Evylaeus) pallilomum* (Strand). D: female labrum, *L. (E.) calceatum* (Scopoli). E: male labrum, *L. (E.) taeniolellum* (Vachal).

pan and adjacent countries. Some specimens examined in this study were borrowed from the following institutions and personal collections, which are referred to in the text by the following abbreviations:

ALKK= Applied Entomological Laboratory, Kyushu Tokai University, Kumamoto Pref., Japan.
DEI= Deutsches Entomologisches Institut im Zentrum für Agrarlandschaftsforschung, Eberswalde, Germany.
EBSU= Division of Environmental Biology, Faculty of Life and Environmental Science, Shimane University, Shimane Pref., Japan.
ELKU= Entomological Laboratory, Faculty of Agriculture, Kyushu University, Fukuoka Pref., Japan.
GC=Dr. Masashi Goubara's Collection, Sendai-shi, Miyagi Pref., Japan.
MC= Mr. Maximilian Schwarz's Collection, Eibenweg, Austria.
MCDS= Dr. Yasuo Maeta's Collection, Division of Environmental Biology, Faculty of Life and Environmental Science, Shimane University, Shimane Pref., Japan.
BMNH= Natural History Museum, London, U. K.
USNM= National Museum of Natural History, Washington, U. S. A.
OLML=Oberösterreichischen Landesmuseums, Linz, Austria.
SCMH=the late Dr. Shôichi F. Sakagami's Collection, Museum of Nature and Human Activities, Hyogo Pref., Japan.

Other specimens without abbreviations belong to the private collection of Ryuki Murao, which are kept temporarily at the Entomological Laboratory, Kyushu

University, Fukuoka, Japan.

Examination of external structure

A stereoscopic microscope (OLYMPUS SZX9) was used for examination of dried specimens. Details of some external structures (labrum, pronotum, mesepisternum, propodeum, inner hind tibial spur, distal parts of metasomal sterna, etc.) were examined with a scanning electron microscope (HITACHI-3000N). Dissection of the labrum first involved placing it in hot water for about 10 minutes; it was then removed from the head under a stereoscopic microscope. After this procedure, the labrum was washed with 99% ethanol, and then dried for about a week.

Examination and drawing of internal structure

The male genitalia and 7-8th metasomal sterna were dissected under a stereoscopic microscope. They were removed from the 5th metasomal sternum, and cleared in a 10% cold solution of KOH for about 24 hours. After being cleared, they were washed with distilled water and preserved in 99% ethanol for later drawing. For examination and drawing, they were mounted on glass slides with glycerol, and observed under a phase-contrast microscope (OLYMPUS BX50).

Terminology and abbreviations

The morphological terminology in description follows Eickwort (1969), McGinley (1986), Sakagami & Tadauchi (1995a), and Michener (2000). Figs. 1-5 show

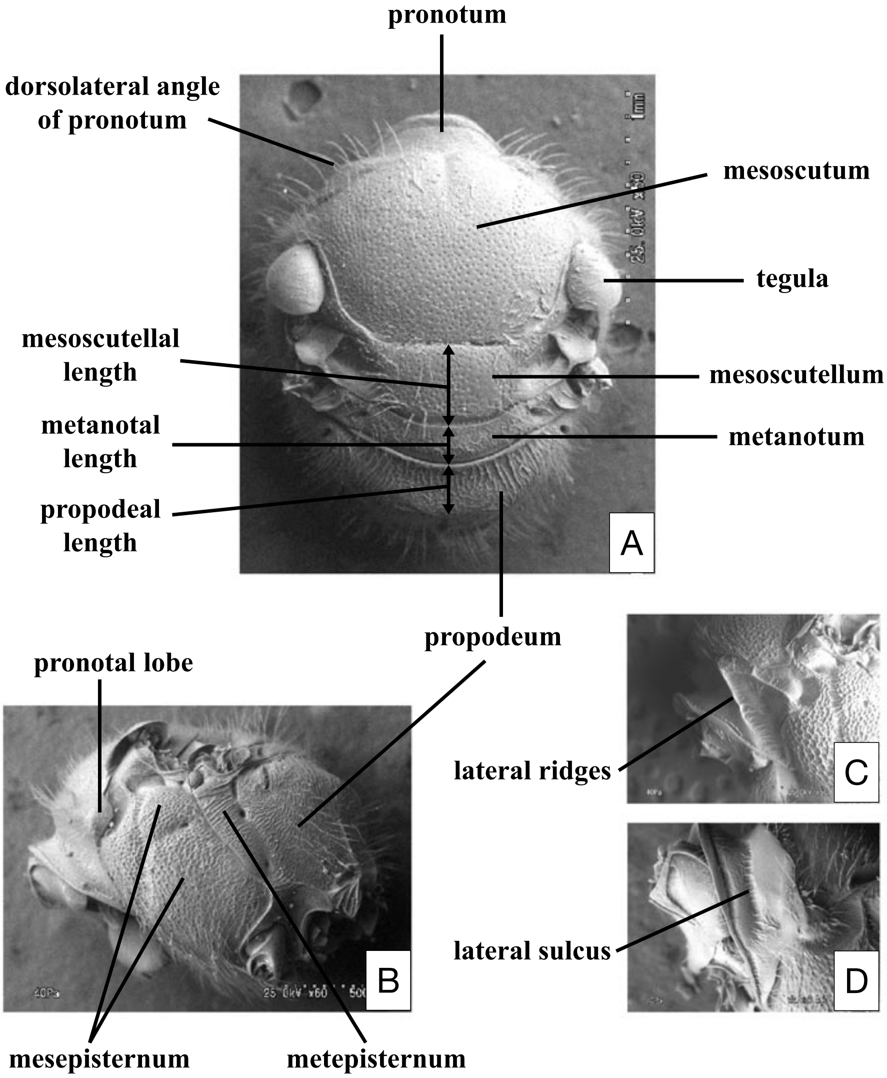

Fig. 3. A: mesosoma in dorsal view. B: mesosoma in lateral view. C, D: pronotum in lateral view. A, B: *Lasioglossum (Evylaeus) pallilomum* (Strand). C: *L. (E.) latilabrum* Murao et Tadauchi. D: *L. (E.) hirashimae* Ebmer et Sakagami.

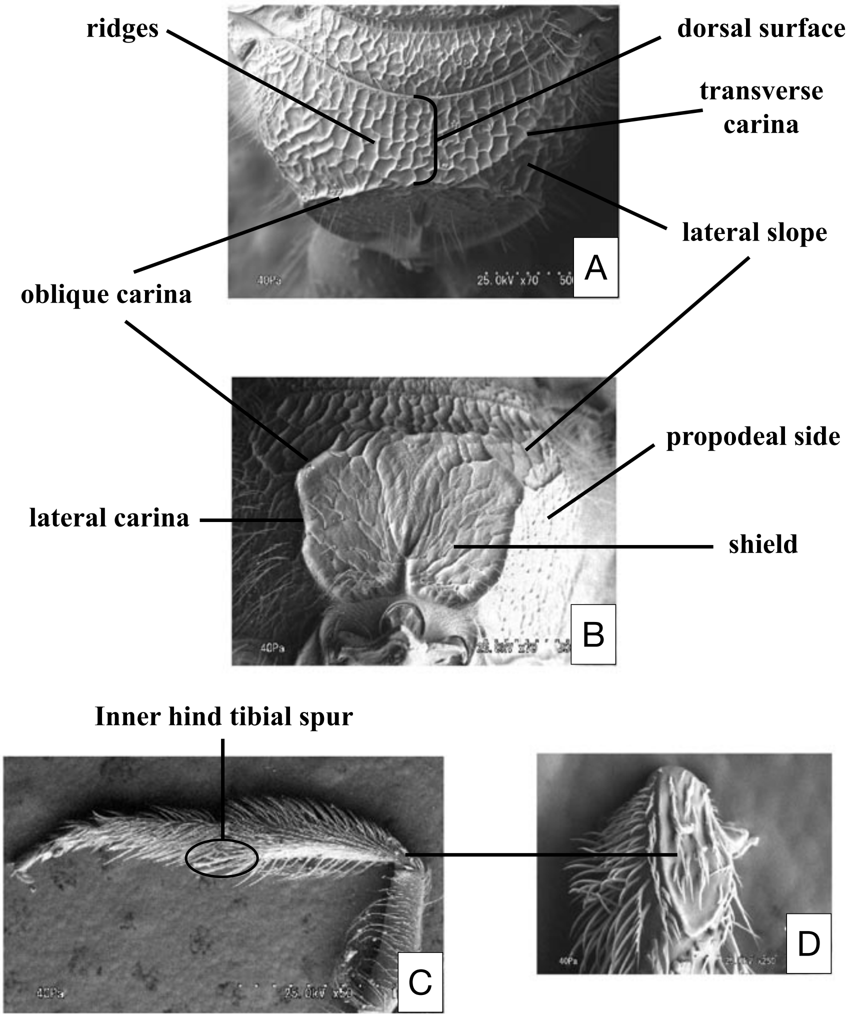

Fig. 4. A, B: propodeum. C: hind leg. D: basitibial plate of hind leg. A: *Lasioglossum (Evylaeus) latilabrum* Murao et Tadauchi. B: *L. (E.) sibiriacum* (Blüthgen). C, D: *L. (E.) apristum* (Vachal).

the morphological characters used for classification at the species or species-group level.

Terms and abbreviations used are as follows: **Fn**= nth flagellar segment; **Tn**, **Sn**= nth metasomal tergum and sternum, respectively; **PP**= Punctures; **IS**= Interspace of punctures.

Measurements

Body length is measured from the base of the antennal fossae to the apex of the pygidial plate. Wing length is measured in a straight line from the base of the tegula to the tip of the forewing. Figs. 1-3 show the points of measurement for the head, antennal segments, and mesosoma.

Distributional and biological information

The distributional range and flight record of each species is mainly based on specimen label data examined in this study. Data collected by previous authors (Goubara *et al*., 2002; Terayama, 2004) are also referred to in this study. Flower records visited by *Evylaeus* species are based on field surveys and specimen label data. The classification system for angiosperms follows that of Cronquist (1981). The scientific names of flowering plants were cited from "*BG Plants Japanese-scientific Names Index (YList)*" (Yonekura & Kajita, 2003). Records of social structure were mainly cited from biological references for each species.

The subgenus *Evylaeus*

Evylaeus Robertson, 1902, Canad. Entomol, 34: 247.

Type species: *Halictus arcuatus* Robertson, 1893, by original designation.

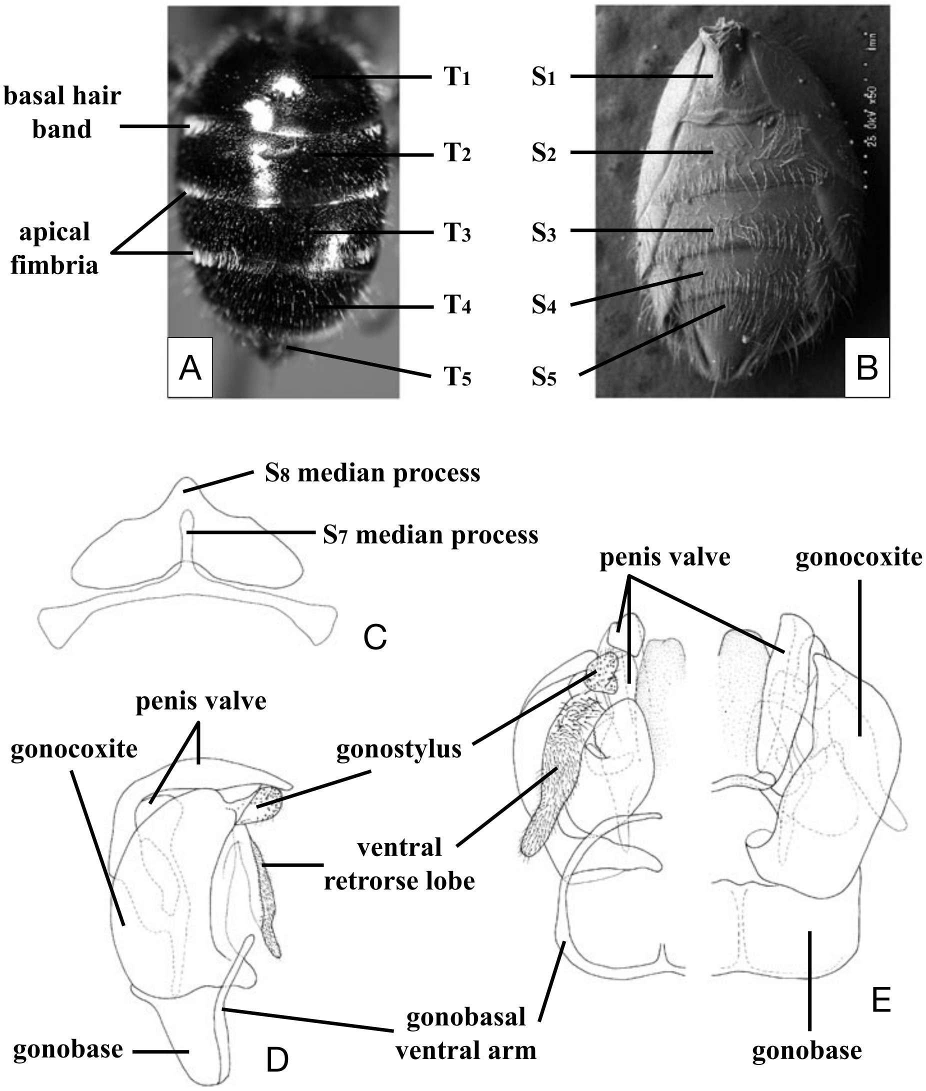

Fig. 5. A: metasomal terga. B: metasomal sterna. C: S7-8. D: male genitalia in lateral view. E: male genitalia (left, ventral view; right, dorsal view). A: *Lasioglossum (Evylaeus) smilodon* Ebmer et Sakagami. B: *L. (E.) pallilomum* (Strand). C-E: *L. (E.) vulsum* (Vachal).

Chloralictus Robertson, 1902, Canad. Entomol, 34: 248. Type species: *Halictus cressonii* Robertson, 1890, by original designation.

Halictomorpha Schrottky, 1911, Rev. Mus. Paulista, 8: 81. Type species: *Halictomorpha phaedra* Schrottky, 1911, by original designation.

Acanthalictus Cockerell, 1924, Ann. Mag. Nat. Hist., (9) 14: 184. Type species: *Halictus dybowskii* Radoszkowski 1877, by original designation.

Rhynchalictus Moure, 1947, Publcoes, avulsas Mus. Paranaense, 3: 5. Type species: *Rhynchalicus rostratus* Moure, 1947, by original designation.

Halictus (Microhalictus) Warncke, 1975, Polskie Pismo Entomol., 45: 85. Type species: *Melitta minutissima* Kirby, 1802, by original designation.

Halictus (Puncthalictus) Warncke, 1975, Polskie Pismo Entomol., 45: 87. Type species: *Hylaeus punctatissimus* Schenck, 1853, by original designation.

Halictus (Rostrohalictus) Warncke, 1975, Polskie Pismo Entomol., 45: 88. Type species: *Halictus longirostris* Morawitz, 1876, by original designation.

Halictus (Smeathhalictus) Warncke, 1975, Polskie Pismo Entomol., 45: 88. Type species: *Melitta smeathmanella* Kirby, 1802, by original designation.

Halictus (Marghalictus) Warncke, 1975, Polskie Pismo Entomol., 45: 95. Type species: *Hylaeus marginellus* Schenck, 1853, by original designation.

Halictus (Inhalictus) Warncke, 1975, Polskie Pismo

Entomol., 45: 96. Type species: *Hylaeus interruptus* Panzer, 1798, by original designation.

Halictus (Calchalictus) Warncke, 1975, Polskie Pismo Entomol., 45: 99. Type species: *Apis calceata* Scopoli, 1763, by original designation.

Halictus (Pyghalictus) Warncke, 1975, Polskie Pismo Entomol., 45: 103. Type species: *Andrena pygmaea* Fabricius, 1804, by original designation.

Halictus (Pauphalictus) Warncke, 1982, Boll. Mus. civ. Stor. natur. Venezia, 32: 87. Type species: *Halictus pauperatus* Brullé, 1832, by original designation.

Lasioglossum (Evylaeus): Michener, 1944, Bull. Amer. Mus. Nat. Hist., 82: 249-250 [designated under the genus *Lasioglossum*]; Ebmer, 1987, Senckenbergiana biol., 68 (1/3): 80-83.

As stated above, *Evylaeus* Robertson is treated here at the subgenus level, although the category of *Evylaeus* has been the object of discussion by some researchers (Michener, 2000; Ebmer, 2002). In particular, it can not be separated clearly using morphological characters from the subgenus *Dialictus* Robertson in the same genus using present systematics data. Each researcher therefore, has a different opinion when dealing with *Evylaeus*. -Michener (2000) regarded *Evylaeus* as containing only the carinate-*Evylaeus* group (the carinaless-*Evylaeus* group was transferred to *Dialictus*). On the other hand, Ebmer (2002) suggested that *Evylaeus* contained the three groups of carinate-*Evylaeus*, carinaless-*Evylaeus*, and the Palaearctic species of *Dialictus* (green-*Evylaeus* group). We follow the opinion of Ebmer (2002) in the present study.

The genus *Lasioglossum* is divided into three subgenera in Japan: *Lasioglossum* Curtis s. str., *Ctenonomia* Cameron, and *Evylaeus*. The subgenus *Evylaeus* is separated from the two allied subgenera by the second submarginal crossvein in the forewing of the female being weaker than the first. This character, however, is not useful when classifying the male. Males of *Evylaeus* are separated from the two allied subgenera by the following artificial key:

1. Basitibial plate of hind leg distinctly or weakly carinate marginally (Figs. 4. D; 25. L) 2
– Basitibial plate of hind leg without carina marginally 3
2. Lateral surface of pronotum with distinct many ridges (Fig. 25. I); shield of propodeum with moderately dense tomentose (Fig. 24. N); S_5 laterally with

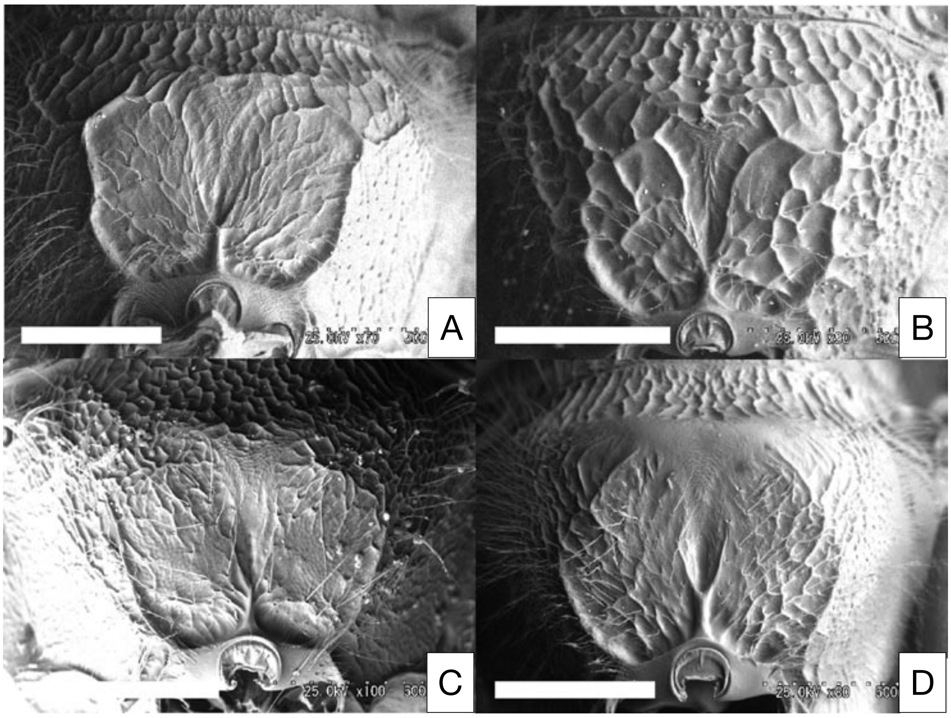

Fig. 6. Diagnostic characteristics of Japanese carinate-*Evylaeus* superspecies-group. A, B: *Lasioglossum (Evylaeus) sibiriacum* (Blüthgen). C: *L. (E.) boreale* Svensson, Ebmer et Sakagami. D: *L. (E.) subtropicum* Sakagami, Miyanaga et Maeta. A: female. B-D: male. Scale: 0.5mm.

moderately long hair tufts (Fig. 24. O) ....**Subgenus *Evylaeus*, in part (*L. percrassiceps*)**

– Lateral surface of pronotum with or without distinct ridges; shield of propodeum with sparse fine branched hairs; S5 laterally without long hair tufts.... .... ***Lasioglossum* s. str.**

Subgenus *Ctenonomia*, in part

3. Mesepisternum with granular or cancellate PP or without distinct PP in the above area; shield of propodeum weakly reticulate or nearly smooth.............. .... **Subgenus *Evylaeus*, in part**

– Mesepisternum coarsely rugulose over the surface (e.g., Fig. 48. H); shield of propodeum coarsely or weakly rugulose (Fig. 6. B-D) 4

4. Mesoscutum medially with dense or moderately dense PP .... **Subgenus *Evylaeus*, in part**

– Mesoscutum medially with sparse PP [additional useful characters: head length/width ratio 0.93-1.0; lower half of clypeus yellow; flagellum beneath blackish brown or brown; IS of mesoscutum without reticulation over the surface; tegula, tibiae and tarsi black or blackish brown] ....**Subgenus *Ctenonomia*, in part (*L. blakistoni*)**

The Palaearctic and a portion of the Nearctic species of *Evylaeus* were divided into three groups, and each group was further divided into many species-groups and species-subgroups by Ebmer (1995, 1997, etc.) and Ebmer & Sakagami (1985a, 1990, etc.). According to their classification, the Japanese species belong to three groups as follows:

1. **carinate-*Evylaeus* group** (in detail, see Ebmer, 1995)
    - **1-1. *apristum* species-group** (in detail, see Ebmer, 2002; Murao & Tadauchi, 2005): *L. (E.) apristum* (Vachal).
    - **1-2. *calceatum* species-group** (in detail, see Ebmer, 1995): *L. (E.) affine* (Smith), *L. (E.) albipes* (Fabricius), *L. (E.) calceatum* (Scopoli), *L. (E.) duplex* (Dalla Torre), *L. (E.) nipponense* (Hirashima).
    - **1-3. *fulvicorne-fratellum* species-group** (in detail, see Ebmer, 1995): *L. (E.) baleicum* (Cockerell), *L. (E.) boreale* Svensson, Ebmer et Sakagami, *L. (E.) caliginosum* Murao, Ebmer et Tadauchi, *L. (E.) nupricola* Sakagami, *L. (E.) sibiriacum* (Blüthgen), *L. (E.) subtropicum* Sakagami, Miyanaga et Maeta, *L. (E.) vulsum* (Vachal).
    - **1-4. *laticeps* species-group** (in detail, see Ebmer, 1995): *L. (E.) hoffmanni* (Strand).
    - **1-5. Between *malachurum*, *laticeps*, and *fulvicorne-fratellum* species-groups** (in Ebmer, 1995): *L. (E.) naitoi* Ebmer et Maeta, *L. (E.) solisortus* Ebmer et Maeta.
    - **1-6. Incertae sedis**: *L. (E.) percrassiceps* (Cockerell), *L. (E.) latilabrum* Murao et Tadauchi.

2. **carinaless-*Evylaeus* group** (in detail, see Ebmer, 1997)
    - **2-1. *leiosoma* species-group** (in detail, see Ebmer & Sakagami, 1985b): *L. (E.) hirashimae* Ebmer et Sakagami.
    - **2-2. *nitidiusculum* species-group** (in detail, see Ebmer & Sakagami, 1985a): *L. (E.) allodalum* Ebmer et Sakagami.
    - **2-3. *politum* species-group** (in Ebmer, 1976): *L. (E.) politum pekingense* (Blüthgen).
    - **2-4. *sexstrigatum* species-group** (in detail, see Ebmer, Maeta & Sakagami, 1994)
        - **2-4-1. *fimbriatellum* species-subgroup**: *L. (E.) amamiense* Ebmer et Sakagami, *L. (E.) frigidum* Sakagami et Ebmer, *L. (E.) ohei* Hirashima et Sakagami, *L. (E.) pallilomum* (Strand), *L. (E.) simplicior* (Cockerell), *L. (E.) smilodon* Ebmer et Sakagami, *L. (E.) speculinum* (Cockerell).
        - **2-4-2. *japonicum* species-subgroup**: *L. (E.) japonicum* (Dalla Torre).
        - **2-4-3. *sexstrigatum* species-subgroup**: *L. (E.) kiautshouense* (Strand), *L. (E.) sexstrigatum* (Schenck), *L. (E.) sphecodicolor* Sakagami et Tadauchi, *L. (E.) taeniolellum* (Vachal).
        - **2-4-4. *zipangu* species-subgroup**: *L. (E.) zipangu* Ebmer et Sakagami.
    - **2-5. *tarsatum* species-group** (in detail, Sakagami & Tadauchi 1995a)
        - **2-5-1. *lucidulum* species-subgroup**: *L. (E.) kuroshio* Takahashi et Sakagami, *L. (E.) longifacies* Sakagami et Tadauchi, *L. (E.) pumilum* Sakagami et Tadauchi, *L. (E.) zunaga* Sakagami et Tadauchi.
        - **2-5-2. *tarsatum* species-subgroup**: *L. (E.) sakagamii* Ebmer, *L. (E.) transpositum* (Cockerell).
    - **2-6. *villosulum* species-group** (in Ebmer, 1976): *L. (E.) villosulum trichopse* (Strand).

3. **green-*Evylaeus* group** (in detail, see Ebmer & Sakagami, 1990; Murao, Ebmer et Tadauchi, 2006)
    - **3-1. *atroglaucum* species-group** (in detail, see Eb-

mer, 2002; Murao, Ebmer et Tadauchi, 2006): *L. (E.) miyabei* Murao, Ebmer et Tadauchi, *L. (E.) problematicum* (Blüthgen), *L. (E.) viride-glaucum* Ebmer et Sakagami, *L. (E.) yamanei* Murao, Ebmer et Tadauchi.

3-2. ***leucopus*** **species-group** (in detail, see Ebmer & Sakagami, 1990): *L. (E.) algirum pseudannulipes* (Blüthgen).

Proposed system of species-group classification for Japanese *Evylaeus* species

As stated above, Ebmer & Sakagami have constructed a species-group classification of the subgenus *Evylaeus* based mainly on the Palaearctic species. However, according to their classification, some species-groups can not be clearly defined (e.g., the *sexstrigatum* species-group). In the present study, we attempt to reconstruct a Japanese species classification based on shared morphological characters as the second step in developing an intrasubgeneric classification system of *Evylaeus* species.

As a result, the Japanese *Evylaeus* is divided into two superspecies-groups (carinate- and carinaless-*Evylaeus* supergroups). The green-*Evylaeus* group is treated as a part of the carinaless-*Evylaeus* supergroup in the present study. In addition, the carinate-*Evylaeus* superspecies-group is divided into five species-groups and two species-subgroups, and the carinaless-*Evylaeus* superspecies-group into 11 species-groups and two species-subgroups. In this paper (Part I), we present an outline of the carinate-*Evylaeus* superspecies-group.

(1). carinate-*Evylaeus* superspecies-group

This supergroup is defined by the following two morphological characters in the male: 1) the mesepisternum with coarse rugulae over the surface (e.g., Fig. 48. H); 2) the shield of the propodeum being coarsely rugulose or sometimes weakly rugulose (Fig. 6. B-D). In the female, this supergroup is characterized by having oblique and lateral carinae on the propodeum distinctly developed, as shown in Fig. 6. A, and lateral carinae of the propodeum connecting to oblique carinae on the upper ends, as presented in Fig. 6. A. Although, these characteristics in the female often disappear through variation in *L. (E.) boreale* Svensson, Ebmer et Sakagami, *L. (E.) solisortus* Ebmer et Maeta, and *L. (E.) subtropicum* Sakagami, Miyanaga et Maeta. This supergroup can not be clearly defined only on the basis of female characteristics.

The supergroup is divided into five species-groups on the basis of characteristics of the labrum, pronotum, basitibial plate, inner hind tibial spur, S_5, and male genitalia.

(1)-1. *apristum* species-group

This group is defined by the following three morphological characters: 1) distal process of labrum spoon-shaped (Fig. 8. B) in the female; 2) inner hind tibial spur with serration (Fig. 8. E) in the female; and 3) gonocoxite with inner margin hoe-shaped anteriorly (for illustration, see Murao & Tadauchi, 2005).

Included species: *L. (E.) apristum* (Vachal). *L. (E.) elaiochromon* Ebmer and *L. (E.) serratum* (Blüthgen) from eastern Asia share the first and second defining characters.

(1)-2. *calceatum* species-group

This group is defined by massive and large-sized gonostylus (e.g., Fig. 11. A).

Included species: *L. (E.) affine* (Smith), *L. (E.) albipes* (Fabricius), *L. (E.) calceatum* (Scopoli), *L. (E.) duplex* (Dalla Torre), and *L. (E.) nipponense* (Hirashima). These constitutional species correspond to the *calceatum* species-group of Ebmer (1995).

(1)-3. *latilabrum* species-group

This group is tentatively included in the carinate-*Evylaeus* supergroup, as the male has not been found. However, the female has distinctly oblique and lateral carinae on the propodeum.

It is defined by the following three morphological characters in the female: 1) distal process of the labrum very broad; 2) lateral surface of pronotum with a distinct ridge; and 3) dorsolateral angle of pronotum acute. See Murao & Tadauchi (2006) for figures illustrating the defining characters.

Included species: *L. (E.) latilabrum* Murao et Tadauchi. *L. (E.) anthrax* Ebmer from eastern Asia shares all of the defining characters.

(1)-4. *percrassiceps* species-group

This group is defined by the following seven morphological characters: 1) lateral surface of pronotum with many distinct ridges in both sexes (Fig. 25. C, I); 2) basitibial plate of hind leg marginally carinate in male (Fig. 25. L); 3) S_5 laterally with moderately long hair tufts in male (Fig. 24. O); 4) apical margin of S_5 distinctly concave on median area in frontal view (Fig. 25. M); 5) gonostylus hook-shaped with long hairs (Fig. 26. C-F); 6) dorsal gonocoxite with oblique striation (Fig. 26. J); and 7) penis valve in part with many spines (Fig.

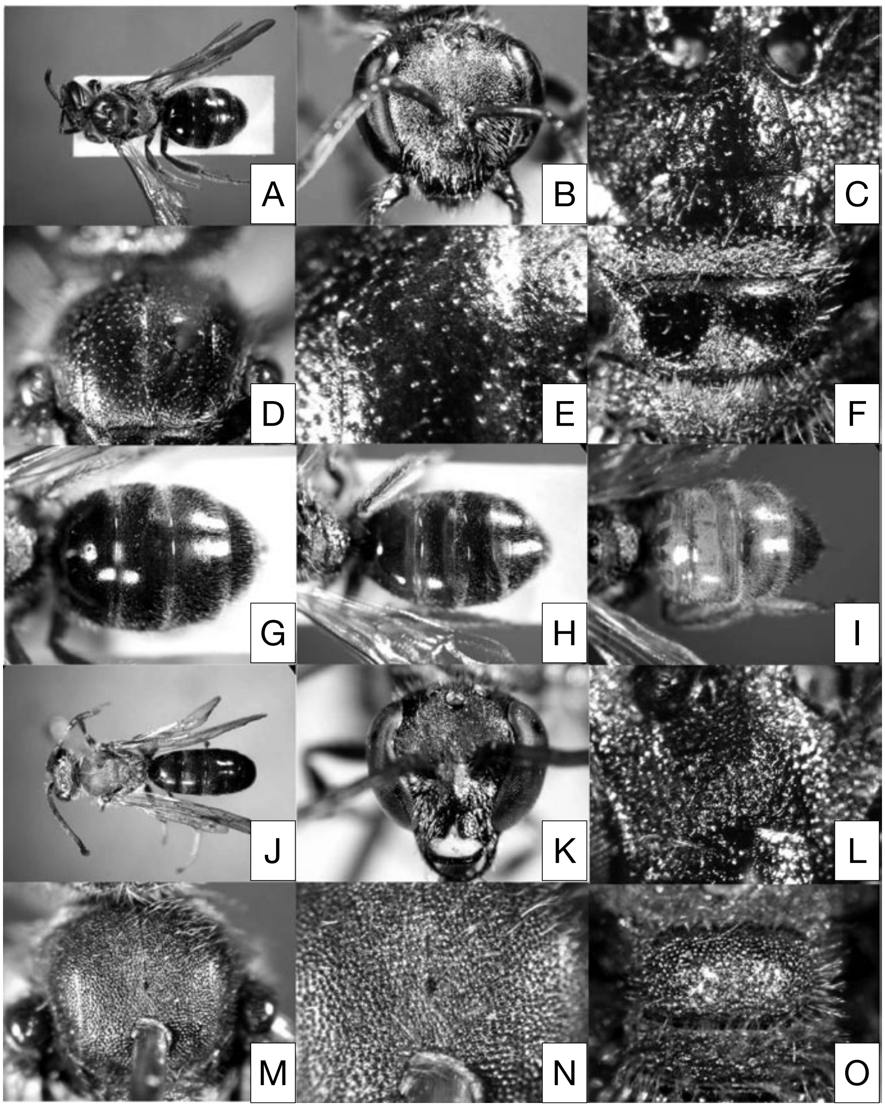

Fig. 7. *Lasioglossum (Evylaeus) apristum* (Vachal). A-I: female. J-O: male. A, J: general habitus. B, K: head in frontal view. C, L: supraclypeal area. D, M: mesoscutum. E, N: sculpture of mesoscutum. F, O: mesoscutellum. G-I: color variation of metasomal terga.

26. I).

Included species: *L. (E.) percrassiceps* (Cockerell).

(1)-5. *vulsum* species-group

This group is defined by the two morphological characters : 1) inner hind tibial spur of female with slender teeth (e. g., Fig. 54. E) in Japanese carinate-*Evylaeus* superspecies-group ; 2) small to medium-sized gonostylus that is perpendicularly issued from the gonocoxite in the Japanese carinate-*Evylaeus* superspecies-group. Furthermore, this group is divided into two subgroups.

(1)-5-1. *hoffmanni* species-subgroup

This subgroup is not clearly defined. However, it is separated from the *vulsum* subgroup by the absence of ventral retrorse lobe on male genitalia.

Included species: *L. (E.) hoffmanni* (Strand), *L. (E.) naitoi* Ebmer et Maeta, and *L. (E.) solisortus* Ebmer et Maeta.

(1)-5-2. *vulsum* species-subgroup

This subgroup is not clearly defined. However, it is separated from the *hoffmanni* subgroup by the presence of ventral retrorse lobe on male genitalia.

Included species: *L. (E.) baleicum* (Cockerell), *L. (E.) boreale* Svensson, Ebmer et Sakagami, *L. (E.) caliginosum* Murao, Ebmer et Tadauchi, *L. (E.) nupricola* Sakagami, *L. (E.) sibiriacum* (Blüthgen), *L. (E.) subtropicum*

Sakagami, Miyanaga et Maeta, and *L. (E.) vulsum* (Vachal). These constitutional species correspond to the *fulvicorne-fratellum* species-group of Ebmer (1995).

Description

apristum species-group

Lasioglossum (Evylaeus) apristum (Vachal, 1903)

(Figs. 7. A-O; 8. A-I; 56. A; 58. A)

Halictus apristus Vachal, 1903, Bull. Mus. Hist. Nat. (Paris), 9: 130 [female, Japan]; Hirashima, 1957, Sci. Bull. Fac. Agr., Kyushu Univ., 16 (1): 4.

Sphecodes pallidulus Matsumura, 1912, Thous. Ins. Jap., Suppl. IV: 209-210 [female, Japan: Kumamoto Pref.]; Matsumura, 1930, Illustr. Thous. Ins. Jap. II: 178; Matsumura, 1931, 6000 Illustr. Ins. Jap.-Emp.: 9; Matsumura, 1932, Illustr. Comm. Ins. Jap. IV: 7, 11.

Lasioglossum (Evylaeus) apristum: Ebmer, 1978a, Ann. Hist.-nat. Mus. Nat. Hung., 70: 313-314; Ebmer, 1995, Linzer biol. Beitr., 27 (2): 542-544 [male, description]; Ikudome, 1999, Ident. Guide Aculeata Nansei Is., Jap.: 582; Ebmer, 2002, Linzer biol. Beitr., 34 (2): 840-841; Murao & Tadauchi, 2005, Esakia, (45): 43-50 [female & male, redescription].

Diagnosis. **Female**: body length, 7.1-8.9 mm (n= 5); head and mesosoma black or weakly blue-greenish; head width distinctly or slightly longer than length, head length/width ratio 0.90-0.98 (n= 10); supraclypeal area (Figs. 7. C; 8. A) weakly shiny, with sparse or moderately dense granular PP (20-30 μø), and IS with weak reticulation; mesoscutum (Fig. 7. D, E) weakly shiny, medially with irregular sparse granular PP (20-30 μø), IS anteriorly with weak reticulation and medially and

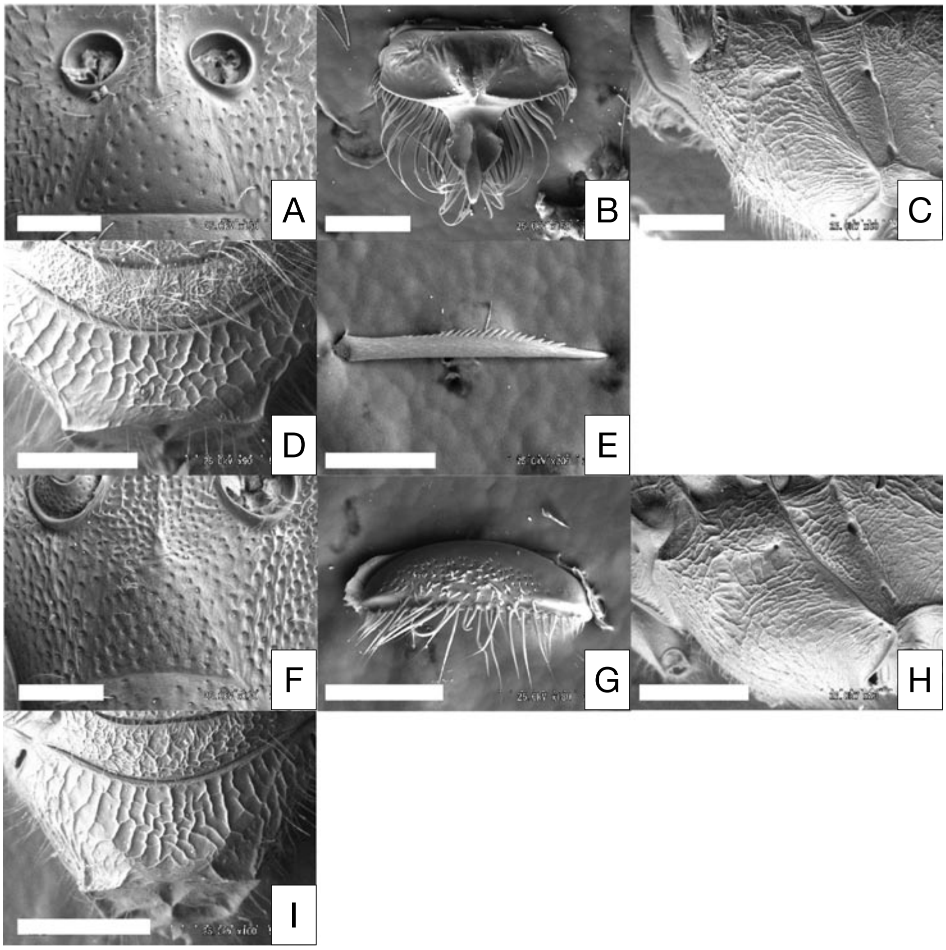

Fig. 8. *Lasioglossum (Evylaeus) apristum* (Vachal). A-E: female. F-I: male. A, F: supraclypeal area. B, G: labrum. C, H: mesepisternum. D, I: propodeal dorsum. E: inner hind tibial spur. Scale: C, D, H, I, 0.5mm; G, 0.25mm; A, B, E, F, 0.2mm.

posteriorly without reticulation or sometimes with weak reticulation; mesepisternum (Fig. 8. C) with coarse rugulae as in male; the length of propodeal dorsum shorter than that of mesoscutellum, and about 1.2 times that of metanotum; propodeal dorsum (Fig. 8. D) with irregular sinuate ridges over the surface as in male; transverse carina of propodeum distinct; T_1 (Fig. 56. A) without striation over the surface as in male, and medially with moderately dense fine PP (≦10 μø). **Male**: body length, 6.6-8.3 mm (n= 5); head width slightly longer or as long as length, head length/width ratio 0.96-1.0 (n= 10); supraclypeal area (Figs. 7. L; 8. F) dimly shiny, but sometimes weakly shiny; lower half of clypeus yellow; flagellum beneath blackish brown; mesosoma dimly blue-greenish or black; F_2 length about 2 times F_1; mesoscutum (Fig. 7. M, N) with cancellate PP (20-40 μø) over the surface; mesoscutellum (Fig. 7. O) somewhat weakly rugulose; the length of propodeal dorsum about 1.2 times that of metanotum; all tibiae basally and apically slightly yellow, sometimes entirely black or brown; basitibial plate of hind leg marginally without carina; all tarsi yellowish brown; T_1 (Fig. 58. A) medially with moderately dense granular PP (20 μø).

Similar species is not found from Japan. In eastern Asia excluding Japan, this species is closely similar to *Lasioglossum (Evylaeus) elaiochoromon* Ebmer (male unknown) from China (Yunnan Province), and *L. (E.) serratum* (Blüthgen) (male unknown) from Nepal and west Bhutan, but it can be separated from the former by the mesoscutum weakly shiny with sparse granular PP in female; from the latter by the T_1 medially with distinct moderately dense fine PP in female, and the T_2 basally with distinct striation in female.

Description and *Variation*. See Murao & Tadauchi (2005).

Distribution. China (northeast, Fujian Province), Korean Peninsula (north, **south= new record**), Japan [Hokkaido, Honshu, Shikoku, Kyushu, Tsushima, Ryukyus (Yaku-shima)].

Flight records. Female: late March to early November. Male: April, and late June to November.

Biology. See Sakagami & Munakata (1966) and Miyanaga *et al*. (1999).

Specimens examined. [**JAPAN**] [**Kyushu**] Nagasaki Pref.: 2 females, Azamo-Taterayama, Tsushima, 27. ix. 1959 (T. Hidaka, K. Morimoto & T. Kawarabata, ELKU). Miyazaki Pref.: 10 males, Inokodani, Kobayashi-shi～Suki-son, 14. iv., 13. ix., 14. ix., 28. ix. 2003 (T. Saigusa).

[**CHINA**] 1 female, Mandschurei, 18. vii. 1949 (V. N. Alin, OLML). [**SOUTH KOREA**] 3 females, Boug-Myong-ri, DongSan-myon, ChunChon-gun, KangWeon-do, 22-23. v. 1992 (O. Tadauchi, ELKU); 1 female, GamJong-ri, Dong-myon, ChunChon-gun, KangWeon-do, 21. v. 1992 (O. Tadauchi, ELKU); 24 males, Yonsil, Mt. Halla-san, Cheju Is., 24. vii. 1990 (O. Tadauchi, ELKU). See Murao & Tadauchi (2005) for other specimens examined.

calceatum **species-group**

Lasioglossum (Evylaeus) affine **(Smith, 1853)**

(Figs. 9. A-L; 10. A-I; 11. A-D; 56. B; 58. B)

Halictus affinis Smith, 1853, Cat. Hym. Brit. Mus., 1: 64 [male, north China: Foo-cho-foo]; Dalla Torre, 1896, Cat. Hym., 10 : 52 ; Cockerell, 1909, Ann. Mag. Nat. Hist., (8) 4: 315 [in key, male]; Blüthgen, 1934, Ark. Zool., A27 (13): 4 [notes, male]; Wu, 1941, Cat. Ins. Sin., 6: 272; Hirashima, 1957, Sci. Bull. Fac. Agr., Kyushu Univ., 16 (1): 3-4.

Halictus mandarinus Strand, 1910, Berl. entomol. Zeitschr., 54 (3/4): 192 [female, China: Kiautschou-Tsingtau]; Blüthgen, 1924, Konowia, 3 (4/6): 256 [in key], 276 [notes]; Blüthgen, 1930, Mitt. Deutsch. entomol. Gesell., 1 (5): 72; Wu, 1941, Cat. Ins. Sin., 6: 272.

Halictus nagasakiensis Strand, 1910, Berl. entomol. Zeitschr., 54 (3/4): 201 [female, Japan: Nagasaki Pref.]; Blüthgen, 1922, Deutsch. entomol. Zeitschr., 1922 (1): 54.

Halictus investigator Strand, 1910, Berl. entomol. Zeitschr., 54 (3/4): 203 [female, China: Tsingtau]; Blüthgen, 1922, Deutsch. entomol. Zeitschr., 1922 (1): 54; Wu, 1941, Cat. Ins. Sin., 6: 272.

Halictus investigatoris Strand, 1915, Entomol. Mitt., 4 (1-3): 63 [female, China: Tsingtau].

Lasioglossum (Evylaeus) affine: Ebmer, 1978a, Ann. Hist.-nat. Mus. Nat. Hung., 70: 314; Ebmer, 1978b, Bonn. zool. Beitr., 29 (1/3): 202; Ebmer, 1980, Linzer biol. Beitr., 12 (2): 501; Ebmer, 1995, Linzer biol. Beitr., 27 (2): 532; Ebmer, 1996, Linzer biol. Beitr., 28 (1): 278-279; Ikudome, 1999, Ident. Guide Aculeata Nansei Is., Jap.: 581-582; Ebmer, 2006, Linzer biol. Beitr., 38 (1): 556.

Redescription

Female. Body length 8.2–9.2 mm, wing length 7.0–8.2 mm (n= 5).

Color. Body black except as follows: mandible with apical half reddish brown; flagellum blackish brown; te-

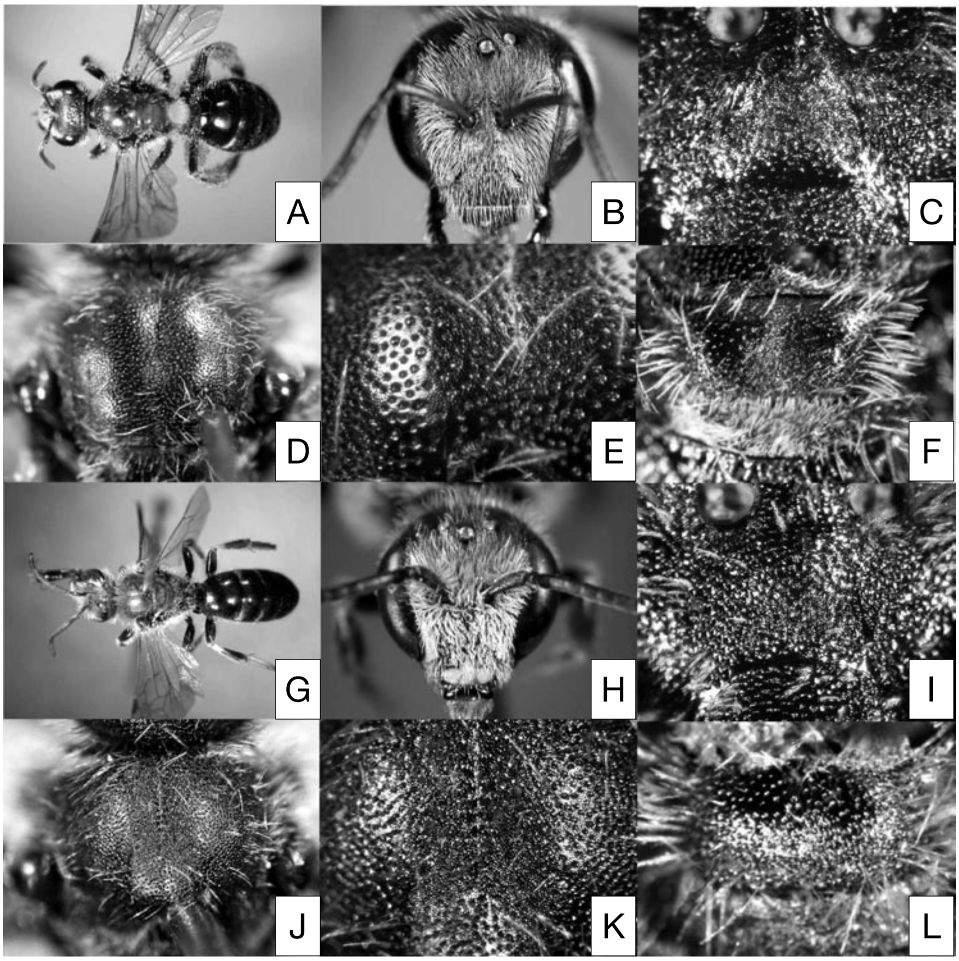

Fig. 9. *Lasioglossum (Evylaeus) affine* (Smith). A-F: female. G-L: male. A, G: general habitus. B, H: head in frontal view. C, I: supraclypeal area. D, J: mesoscutum. E, K: sculpture of mesoscutum. F, L: mesoscutellum.

gula posteriorly and marginally brownish semitransparent; tibial spur yellow; posterior margins of metasomal terga broadly yellowish brown semitransparent. Wings nearly transparent; veins yellowish brown or brown; pterostigma blackish brown.

Pilosity. Body hairs dull whitish to yellowish brown. Head with moderately dense fine branched hairs. Hairs on mesosoma finely branched except as follows: lateral lobe of pronotum and medial area of metanotum with dense tomentose; hind trochanter and femur with plumose hairs, forming scopa. T_1 anteriorly and laterally with moderately dense fine branched hairs. T_{2-4} with moderately dense simple and short hairs on disc, laterally with sparse fine branched hairs, and posterior margin with dense short and simple hairs. Basal hair bands present on T_{2-4}.

Structure. Head width distinctly or slightly longer than head length; head length/width ratio 0.92-0.98 (n=10). Vertex behind ocelli with transverse ridges. Distance between lateral ocelli shorter than the distance between lateral ocellus and compound eye. Frons and paraocular area weakly shiny, with cancellate PP (20-30 μø). Supraclypeal area (Figs. 9. C; 10. A) nearly flat in lateral view, somewhat dimly shiny, with moderately dense granular PP (20-25 μø); IS with very weak reticulation. Clypeal length as long as the distance between lower rim of antennal socket and upper margin of clypeus. Clypeus flat in lateral view, weakly shiny, with moderately dense granular PP (20-25 μø) on upper half, and with sparse larger shallow PP (30-45 μø) on lower half; IS with weak reticulation on upper half, and without reticulation or with very weak reticulation on lower half. Basal area of labrum about 2.3 times as wide as long; basal elevation well developed, medially slightly depressed in frontal view; lateral projection of distal process moderately developed, rounded; keel of distal process moderately broad, apically pointed in frontal view; labral fimbria all acutely pointed at apex. Mandible bidentate. Hypostomal carina well developed; its anterior angle obtuse. Postgena somewhat smooth. Scape length about 1.0 mm (n= 5), F_1 length about 1.2 times or as long as F_2.

Pronotum with dorsolateral angle obtuse; lateral sulcus distinct. Mesoscutum (Fig. 9. D, E) weakly shiny, with dense granular PP (20-25 μø) over the surface; IS with distinct or weak reticulation over the surface. Mesoscutellum (Fig. 9. F) weakly shiny, medially weakly depressed, marginally and longitudinally with homogeneous PP and IS as in mesoscutum. Metanotum rugulose. Mesepisternum (Fig. 10. C) coarsely rugulose. Metepisternum with transverse ridges on upper half, with weak rugulae on lower half. Propodeum: the length of propodeal dorsum shorter than that of mesoscutum, and about 1.3 times that of metanotum; propodeal dorsum (Fig. 10. D) with irregular sinuate ridges over the surface; transverse carina disitinct; oblique carinae connected with transverse carina at upper ends; propodeal side weakly rugulose; shield reticulate. Basitibial plate of hind leg marginally carinate. Inner hind tibial spur (Fig. 10. E) with 8-12 small teeth (n= 50).

Metasomal terga weakly shiny. T_1 (Fig. 56. B) medially with moderately dense fine PP (≦10 μø), and posteriorly with sparse pores and weak transverse striation; IS medially with distinct transverse striation. T_2 basally and medially with dense fine PP (≦10 μø), and posteriorly with weak transverse striation. T_{3-4} with moderately dense pores and weak transverse striation over the surface.

Male. Body length 8.0–9.2 mm, wing length 7.2–7.7 mm (n= 5).

Color. Similar to female except as follows: lower half of clypeus yellow; fore and middle tibiae basally

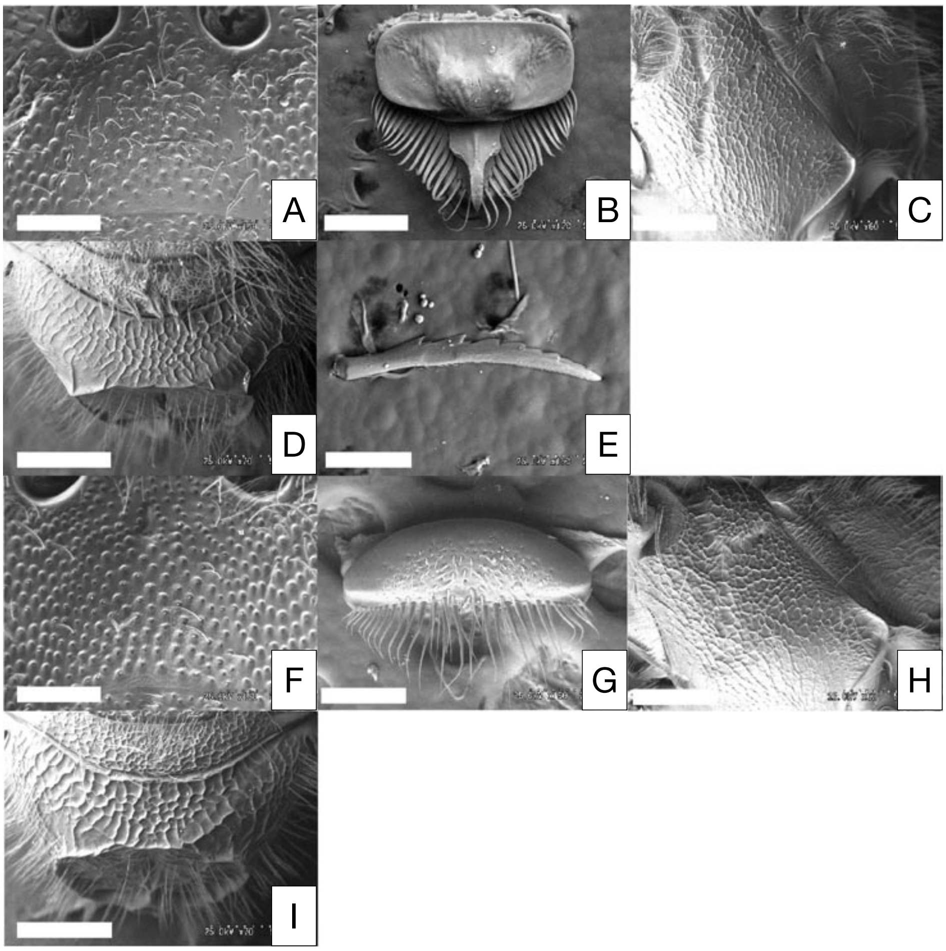

Fig. 10. *Lasioglossum (Evylaeus) affine* (Smith). A-E: female. F-I: male. A, F: supraclypeal area. B, G: labrum. C, H: mesepisternum. D, I: propodeal dorsum. E: inner hind tibial spur. Scale: C, D, H, I, 0.5mm; B, 0.25mm; A, E-G, 0.2mm.

yellow, and apically slightly yellow; hind tibiae basally and apically yellow; all tarsi yellow or yellowish brown.

Pilosity. Similar to female except as follows: lower half of paraocular area, supraclypeal area, and upper half of clypeus with dense tomentose; metanotum with sparse fine branched hairs; T_{2-3} basally with moderately dense tomentose.

Structure. Similar to female except as follows.

Head length slightly or distinctly longer than head width; head length/width ratio 1.02-1.09 (n= 10). Vertex behind ocelli weakly rugulose. Distance between lateral ocelli as long as the distance between lateral ocellus and compound eye. Supraclypeal area (Figs. 9. I; 10. F) with cancellate PP (25-30 μø). Clypeal length about 1.5 times the distance between lower rim of antennal socket and upper margin of clypeus. Basal area of labrum about 3 times as wide as long; basal elevation and distal process absent. Mandible edentate. F_2 length as long as or about 1.2 times F_1.

The sculptures of metanotum coarser than in female. Propodeal dorsum (Fig. 10. I) with coarse sinuate ridges; propodeal side with coarse rugulae. Basitibial plate of hind leg marginally without carina. Inner hind tibial spur without distinct teeth.

T_1 (Fig. 58. B) medially with dense granular PP (15-20 μø), anteriorly and posteriorly with very weak transverse striation. T_{2-3} basally and medially with dense granular PP (20-25 μø), and posteriorly with sparse

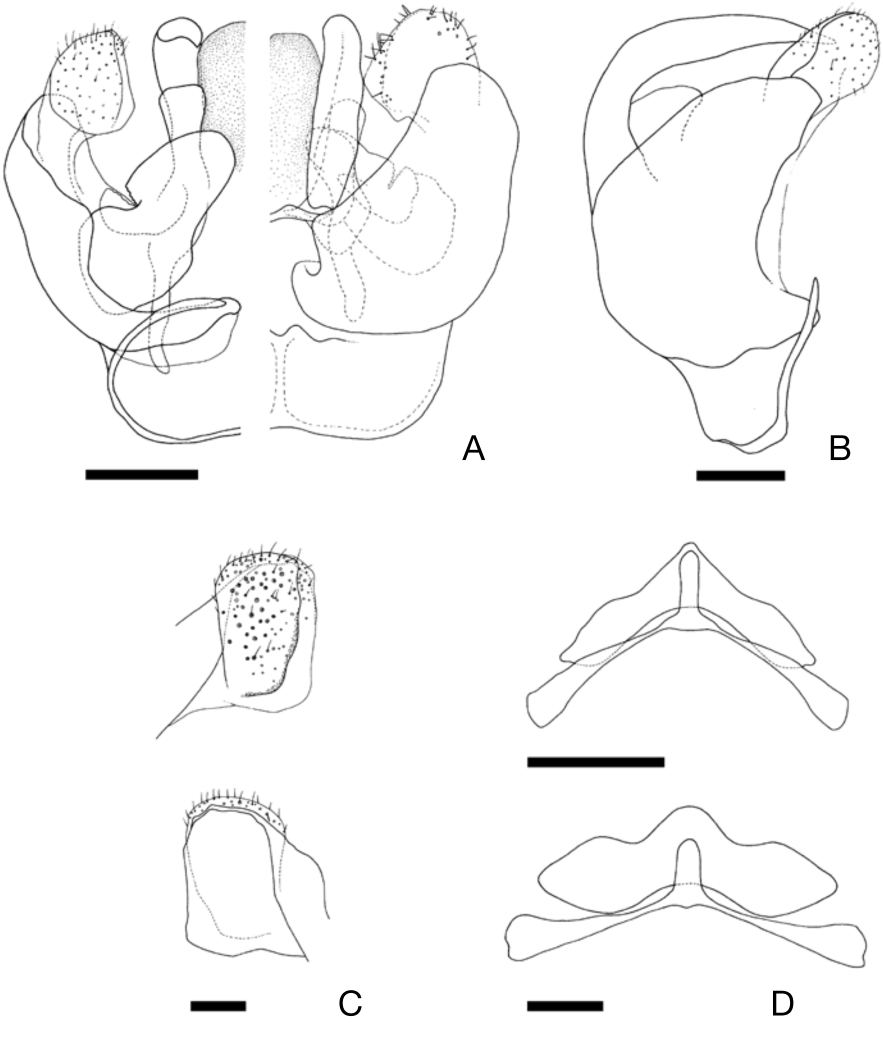

Fig. 11. *Lasioglossum (Evylaeus) affine* (Smith). A-C: male genitalia. D: S_{7-8}. A: left, ventral view; right, dorsal view. B: lateral view. C: gonostylus (upper, ventral view; lower, dorsal view). Scale: D (upper), 0.5mm; D (lower), 0.25mm; A, B, 0.2mm; C, 0.1mm.

granular PP (25-30 μø) and very weak transverse striation. S_7 with long, apically rounded median process; S_8 apically with truncate or rounded median process (Fig. 11. D).

Male genitalia (Fig. 11. A-C). Gonobasal ventral arm ring-shaped, and not connected each other at upper ends in ventral view; the bottom nearly flat. The surface of gonocoxite smooth. Gonostylus (Fig. 11. C) with moderately dense pores and sparse short hairs. Ventral retrorse lobe absent.

Remarks. In Japan, this species is relatively similar to *Lasioglossum (Evylaeus) calceatum* (Scopoli) and *L. (E.) duplex* (Dalla Torre), but can be separated from the two allied species by the longer distance between vertex and posterior ocelli [*L. (E.) affine*, 0.23-0.3 mm; *L. (E.) calceatum* and *L. (E.) duplex*, 0.1-0.2 mm] in female, the T_1 medially with dense PP and distinct striation in female, the F_2 length as long as or about 1.2 times F_1 [*L. (E.) calceatum* and *L. (E.) duplex*, about 1.8-1.9 times] in male, and the shape of gonostylus.

Distribution. Russian Far East (Primorsky), China (East), Korean Peninsula (north, **south= new record**), Japan [Hokkaido, Honshu, Shikoku, Kyushu, **Tsushima= new record**, Ryukyus (Yaku-shima, Tanegashima)], Taiwan.

Flight records. Female: April to late November. Male: June to December.

Biology. See Sakagami *et al*. (1982).

Specimens examined. Holotype: male, Foo-chofoo, North China (BMNH). *Other material*. [**JAPAN**] We have examined 474 females and 321 males from the following localities in Japan: Hokkaido, Aomori, Iwate, Miyagi, Yamagata, Fukushima, Niigata, Ibaraki, Tokyo, Fukui, Nagano, Gifu, Osaka, Hyogo, Tottori, Shimane, Yamaguchi, Kagawa, Fukuoka, Saga, Nagasaki, Oita, Kumamoto Prefectures. Some of the specimens examined are listed as follows: [**Hokkaido**] 1 female, Yunokawa, Hakodate, 2. vii. 1961 (M. Munakata, SCMH). [**Honshu**] Aomori Pref.: 1 female, Mt. Bonzyu, Namioka, 1. viii. 1983 (K. Goukon, SCMH). Iwate Pref.: 5 females, Takizawa, Exp. Forests, 17. vi. 1976 (Y. Maeta & T. Matsumura, SCMH). Tokyo: 1 male, Nakatoh, Musashimurayama-shi, 17. x. 1986 (H. Takahashi, SCMH). Hyogo Pref.: 2 females, Mt. Ôyasan, Inagawa-cho, Kawabe-gun, 5. v. 2003 (K. Mitai). [**Shikoku**] Kagawa Pref.: 1 male, Zentsuji, 14. viii. 1959 (Y. Miyatake, ELKU). [**Kyushu**] Saga Pref.: 10 females and 3 males, Kamiozoegawa, Fuji, 22. iv., 13. v., 25. v., 12. vii., 24. x., 13. xi. 2002 (O. Tadauchi & R. Murao, ELKU). Nagasaki Pref.: 1 female, Sasu-touge, Tsushima, 18. ix. 1972 (K. Kanmiya, ELKU). Kumamoto Pref.: 15 females and 69 males, Nishihara-mura, Asogun, 22. iv., 29. iv., 12. v., 29. v., 17. vii., 26. vii., 10. x., 19. x., 27. x., 6. xi., 19. xi., 28. xi., 8. xii., 21. xii. 2000 (R. Murao & M. Murase, ALKK).

[**CHINA**] 1 female, Qing Ling Shan mts., 40km SE Taibai, Hou Zen Zi vill., Shaanxi Prov., 11. vii. 1998 (Zd. Jindra, OLML); 4 females, Xiexian, 111, 6’-34, 8’, Zhogtiao Shan mt., 22-24. v. 1996 (J. Halada, OLML); 1 female, Yauchi env., 107, 6’-37, 4’, 11. v. 1996 (J. Halada, OLML); 5 females, Ganguyi, 110, 3’-36, 8’, 35km, NE of Yanan, 17-18. v. 1996 (J. Halada, OLML); 29 females, Monan, 111, 7’-34, 7’, river Auang He, 26-28. v. 1996 (J. Halada, OLML). [**RUSSIAN FAR EAST**] 1 female, SU-USSURI reg., Sargeyavka, 70km, W. W. Usauriysk, Primorsky, 27. vii. 1990 (S. Becvar, OLML). [**NORTH KOREA**] 1 female, Nampo, Staudamm, 20m, 20. vii. 1988 (P. Salk, OLML). [**SOUTH KOREA**] 12 females and 23 males, Sogwipo, Cheju Is., 22. x. 2005 (O. Tadauchi & R. Murao); 7 females, Myeong-doam, 400-600m, Cheju-shi, Cheju Is, 15. ix. 1998 (O. Tadauchi, ELKU); 16 females and 1 male, Kwanumsa, 500m, Cheju-shi, Cheju Is., 14. ix. 1998 (O. Tadauchi); 7 females and 1 male, Pyoson-ri, Namjeju-gun, Cheju Is., 16. ix. 1998 (O. Tadauchi, ELKU).

Lasioglossum (Evylaeus) albipes **(Fabricius, 1781)**

(Figs. 12. A-L; 13. A-I; 14. A-D; 56. C; 58. C)

Apis albipes Fabricius, 1781, Spec. Insect., 1: 486 [male, Italy].

Hylaeus abdominalis Panzer, 1798, Faun. Ins. Germ., 5: 19, 53 [male, Austria].

Halictus malachurellus Strand, 1909, Arch. Naturg., 75 (1): 40-41 [male, Europe].

Halictus albipes Dalla Torre, 1896, Cat. Hym., 10: 52; Blüthgen, 1924, Konowia, 3 (2/3): 83 [in key]; Blüthgen, 1934, Ark. Zool., A27 (13): 4 [in list, male]; Hirashima, 1957, Sci. Bull. Fac. Agr., Kyushu Univ., 16 (1): 4.

Halictus albipes var. *alpicola* Blüthgen, 1921, Deutsch. entomol. Zeitschr, 1920/1921 (3/4): 284 [female, Switzerland].

Halictus albipes var. *rubelloides* Blüthgen, 1924, Konowia, 3 (1): 55 [female, Turkestan].

Lasioglossum (Evylaeus) albipes: Ebmer, 1971, Naturk. Jahrb. Stadt Linz, 1971: 92-93; Ebmer, 1978a, Ann. Hist.-nat. Mus. Nat. Hung., 70: 314; Ebmer, 1978b, Bonn. zool. Beitr., 29 (1-3): 201-202; Ebmer, 1978c, Linzer biol. Beitr., 10 (1): 46; Ebmer, 1988, Linzer biol. Beitr., 20 (2): 598.

Lasioglossum (Evylaeus) albipes albipes: Ebmer, 1995, Linzer biol. Beitr., 27 (2): 533; Ebmer, 1996, Linzer biol. Beitr., 28 (1): 279; Ebmer, 2006, Linzer biol. Beitr., 38 (1): 555.

Redescription

Female. Body length 6.5–8.9 mm, wing length 6.0–7.1 mm (n= 5).

Color. Body black except as follows: mandible with apical half reddish brown; flagellum beneath blackish brown or brown; tegula marginally yellowish brown semitransparent; tibial spur yellow; posterior margins of metasomal terga broadly yellowish semitransparent. Wings nearly transparent; veins yellowish brown or brown; pterostigma brown.

Pilosity. Body hairs dull whitish to yellowish brown. Hairs on head finely branched, sparse. Hairs on mesosoma finely branched except as follows: lateral lobe of pronotum and medial area of metanotum with moderately dense tomentose; hind trochanter and femur with plumose hairs, forming scopa. Hairs on anterior and lateral portions of T_1 finely branched, sparse. T_2 with moderately dense simple and short hairs over the surface. T_{3-4} with similar hairs to T_2 over the surface. Basal hair bands present on T_{2-4}, and covering over the basal area of T_{2-3}.

Structure. Head length slightly or distinctly longer than head width; head length/width ratio 1.03-1.06 (n= 10). Vertex behind ocelli with transverse ridges. Distance between lateral ocelli as long as the distance between lateral ocellus and compound eye. Frons and paraocular area weakly shiny, with cancellate PP (20-30 μø). Supraclypeal area (Figs. 12. C; 13. A) slightly convex in lateral view, weakly shiny, with dense granular PP (20-25 μø); IS with weak reticulation. Clypeal length slightly longer than the distance between lower rim of

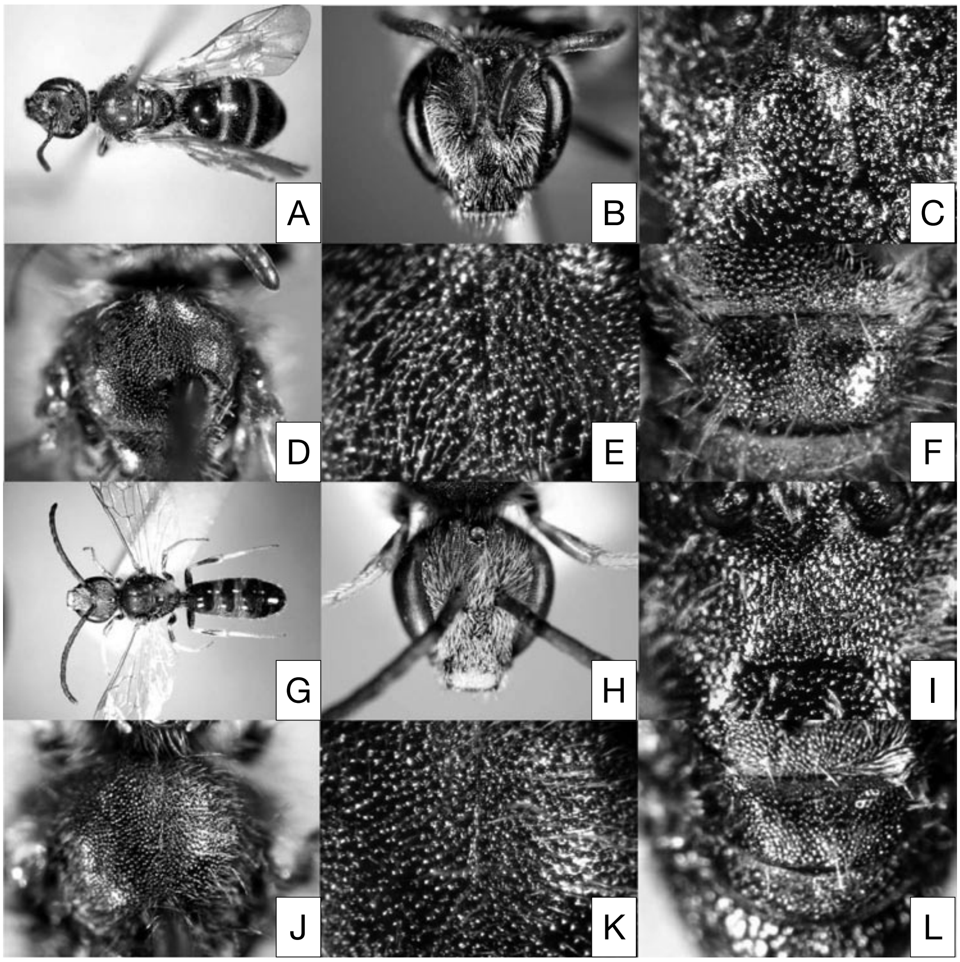

Fig. 12. *Lasioglossum (Evylaeus) albipes* (Fabricius). A-F: female. G-L: male. A, G: general habitus. B, H: head in frontal view. C, I: supraclypeal area. D, J: mesoscutum. E, K: sculpture of mesoscutum. F, L: mesoscutellum.

antennal socket and upper margin of clypeus. Clypeus nearly flat in lateral view, weakly shiny, with moderately dense granular PP (20-40 μø) on upper half, and with sparse granular PP (30-40 μø) on lower half; IS without reticulation over the surface. Basal area of labrum about 2.5 times as wide as long; basal elevation well developed; lateral projection of distal process well developed, rounded; distal keel of distal process moderately broad, apically bluntly pointed in frontal view; labral fimbria all acutely pointed at apex. Mandible bidentate. Hypostomal carina well developed; its anterior angle obtuse. Postgena with weak longitudinal striation. Scape length 0.8-0.9 mm (n= 5), F_1 length as long as F_2.

Pronotum with dorsolateral angle obtuse; lateral sulcus distinct. Mesoscutum (Fig. 12. D, E) weakly shiny, anteriorly, medially and marginally with dense granular PP (20-35 μø), and posteriorly with moderately dense granular PP (20-35 μø); IS anteriorly and medially with weak reticulation, and posteriorly without reticulation. Mesoscutellum (Fig. 12. F) weakly shiny, medially weakly depressed, sculpture similar to mesoscutum. Metanotum with weak rugulae. Mesepisternum (Fig. 13. C) with coarse rugulae. Metepisternum with transverse ridges on upper half, with weak rugulae on lower half. Propodeum: the length of propodeal dorsum shorter than that of mesoscutellum, and about 1.3 times that of metanotum; propodeal dorsum (Fig. 13. D) with irregular sinuate ridges over the surface; transverse carina weak; oblique carinae connected transverse carina at upper ends; propodeal side and shield rugulose. Basitibial plate of hind leg marginally carinate. Inner hind tibial spur (Fig. 13. E) with 5-7 small teeth (n= 20).

Metasomal terga with distinct oily-dull luster. T_1 (Fig. 56. C) without distinct striation over the surface, and medially with sparse fine PP (≦10 μø) (rather obscure PP). T_{2-4} with moderately dense pores over the surface;

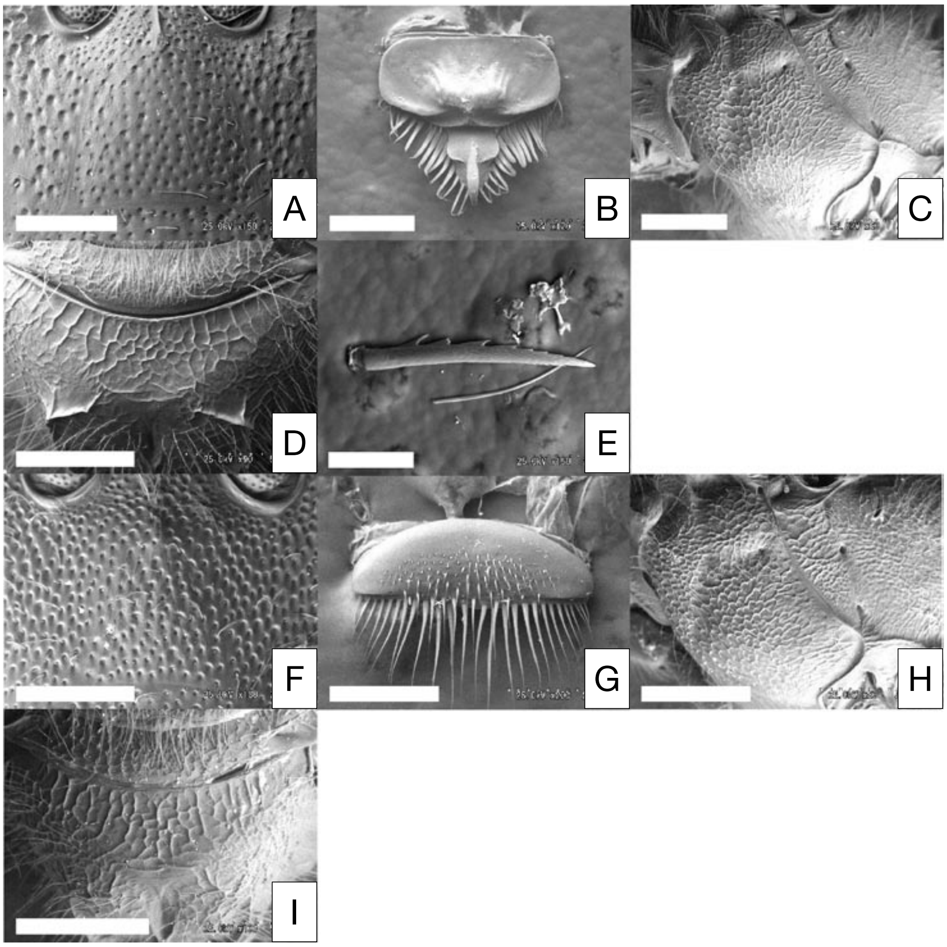

Fig. 13. *Lasioglossum (Evylaeus) albipes* (Fabricius). A-E: female. F-I: male. A, F: supraclypeal area. B, G: labrum. C, H: mesepisternum. D, I: propodeal dorsum. E: inner hind tibial spur. Scale: C, D, H, I, 0.5mm; B, F, 0.25mm; A, E, G, 0.2mm.

T_{2-3} medially and posteriorly with very weak reticulation; T_4 with weak reticulation over the surface.

Male. Body length 7.2–9.0 mm, wing length 6.0–6.7 mm (n= 5).

Color. Similar to female except as follows: mandible medially, lower half of clypeus, labrum, lateral lobe of pronotum yellow; fore tibia nearly yellow, middle and hind tibiae basally and apically yellow; all tarsi yellow to yellowish brown; T_1 laterally and posteriorly pale reddish; T_{2-3} anteriroly, laterally and posteriorly pale reddish.

Pilosity. Similar to female except as follows: lower half of paraocular area, supraclypeal area, and upper half of clypeus with dense tomentose; hairs on metanotum finely branched, sparse; hind trochanter and femur with simple and finely branched hairs, sparse; basal hair bands absent; metasomal terga with sparse short hairs on disc.

Structure. Similar to female except as follows.

Head length/width ratio 1.11-1.16 (n= 10). Vertex behind ocelli with weak rugulae. Distance between lateral ocelli slightly longer than the distance between lateral ocellus and compound eye. Basal area of labrum about 3 times as wide as long; basal elevation absent and distal process absent. Mandible edentate. Scape length 0.4-0.5mm (n= 5), F_2 length about 2.1 times F_1.

Mesoscutum (Fig. 12. J, K) weakly shiny, with cancellate PP (20-30 μø) over the surface; IS anteriorly with weak reticulation, medially and posteriorly without reticulation or with very weak reticulation. The sculptures

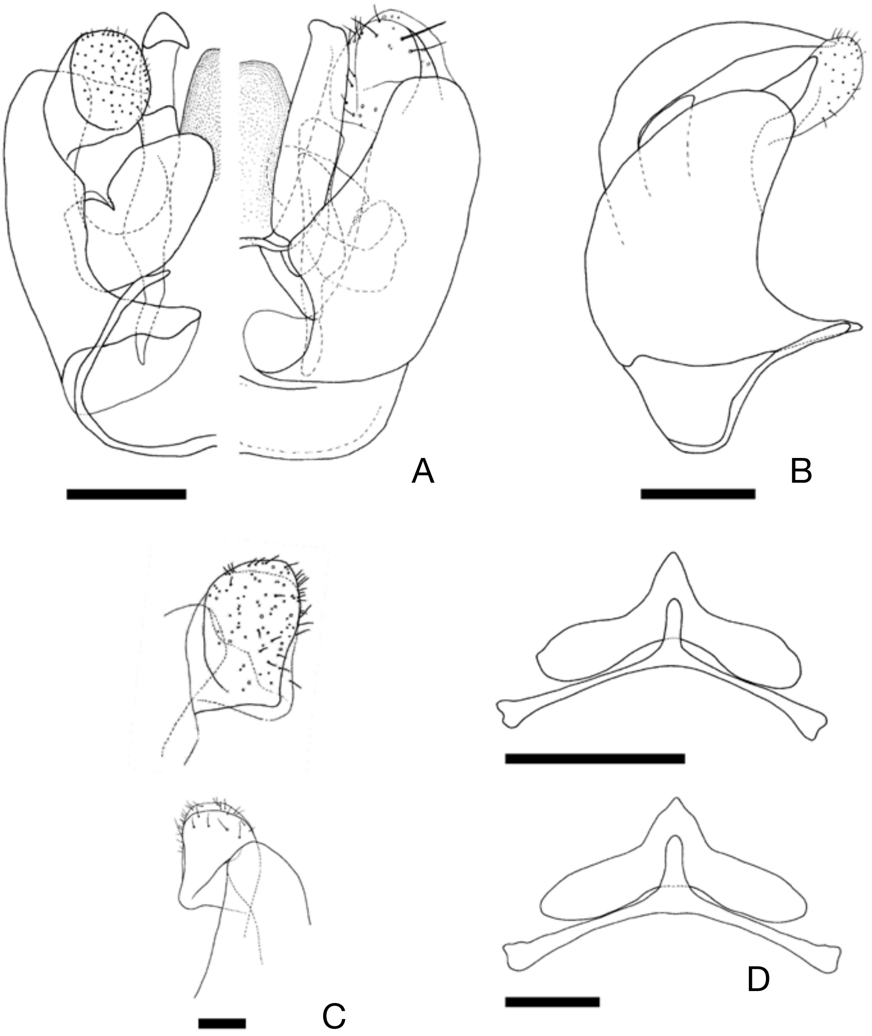

Fig. 14. *Lasioglossum (Evylaeus) albipes* (Fabricius). A-C: male genitalia. D: S_{7-8}. A: left, ventral view; right, dorsal view. B: lateral view. C: gonostylus (upper, ventral view; lower, dorsal view). Scale: D (upper), 0.5mm; D (lower), 0.25mm; A, B, 0.2mm; C, 0.1mm.

of metanotum and propodeum coarser than in female. Basitibial plate of hind leg marginally without carina. Inner hind tibial spur without distinct teeth.

Metasomal terga weakly shiny. T_1 (Fig. 58. C) medially with moderately dense fine PP (≦10 μø). T_{2-3} medially with moderately dense granular PP (15-18 μø), basal and posterior margins with weak transverse striation. T_4 with very weak transverse striation over the surface. S_{7-8} (Fig. 14. D) with long, apically rounded median process.

Male genitalia (Fig. 14. A-C). Gonobasal ventral arm nearly ring-shaped, and not connected each other at upper ends in ventral view; the bottom nearly flat. The surface of gonocoxite smooth. Gonostylus (Fig. 14. C) with sparse pores and short hairs. Ventral retrorse lobe absent.

Variation. Coloration of the metasoma presents black and partly pale red types in female. Ebmer (1995) reported that individuals with red-coloured metasoma occurred in Central Asia and recognized this population as a separate subspecies. In the Japanese population, the metasomal coloration is entirely black.

Remarks. This species is divided into three subspecies based on coloration of the metasoma by Ebmer (1995): ssp. *albipes* occurring from Europe to Japan, ssp. *rubelloides* (Blüthgen) from Central Asia, and ssp. *villosum* Ebmer from Russian Far East (Primorsky). According to the comments by Pesenko *et al.* (2000), it is impossible to distinguish them as separate subspecies, because red and dark-colored individuals so widely and commonly spread in Eurasian steppes, and the status of ssp. *villosum* described on the basis of three females, needs to be examined upon more extensive materials. We share the opinion of Pesenko *et al.* (2000).

In Japan, this species is closely similar to *Lasioglossum (Evylaeus) calceatum* (Scopoli), but can be separated from it by the head shape more elongate in female, the labrum yellow in male (but this difference is only useful in the Japanese population), the sculptures of propodeal dorsum coarser than *L. (E.) calceatum* in male, the metasomal terga with distinct oily-dull luster in female, the T_{1-3} marginally pale reddish in male (but this difference is only useful in the Japanese population), and the shape of gonostylus.

Distribution. Transpalearctic: from Europe to eastern Asia. In Asia, this species is recorded from the following localities: Uzbekistan (Tashkent), Russian Far East (Siberia, Sakhalin, Primorsky, Kurile Islands), China (South Kansu), Korean Peninsula, Japan (Hokkaido, northern and central parts of Honshu).

Flight records. Female: May to September. Male: August to October.

Biology. See Plateaux-Quénu (1993).

Specimens examined. [**JAPAN**] [**Hokkaido**] 2 males, Bakkai, Wakkanai, 20. viii. 1984 (O. Tadauchi, ELKU); 3 females, Moiwa, 3. vii. 1972 (Kawano, SCMH); 3 females, Rebun-tou, 24. vi. 1979 (K. Hoshikawa, SCMH); 2 females and 3 males, Hamakoshimizu, 27. v. 1966, 14. ix. 1966, 28. ix., 1966, 19. vi. 1967 (SCMH); 2 females and 3 males, Kabuka, Rebun-tou, 19. viii. 1984 (O. Tadauchi, ELKU); 1 male, Tenneru n., Kushiro, 1968. (E. Ohtsuka, SCMH); 2 females, Habomai, Nemuro, 28. vii. 1984 (O. Tadauchi, ELKU); 2 females, Rausu-Seseki, Shiretoko, 16. vi. 1984 (O. Tadauchi, ELKU); 2 females, Wakkanai-kûkou, 16. viii. 1984 (O. Tadauchi, ELKU); 4 females and 1 male, Nosappu-misaki, Nemuro, 13. ix. 1984 (O. Tadauchi, ELKU). [**Honshu**] Gunma Pref.: 1 female and 2 males, Kazawa, 17. viii. 1972 (Y. Yoshiyasu, ELKU). Yamanashi Pref.: 1 male, Mt. Yashiga-mine, Chino-shi, 7. ix. 1966 (T. & H. Suda, ELKU). Nagano Pref.: 5 females, Mt. Hakuba-dake, 1800m, 13. viii. 1974 (Tamasawa, ELKU); 2 males, Mt. Kiriga-mine, Suwa-shi, 6. ix. 1966 (T. & H. Suda, ELKU); 1 male, Mt. Ogato, Utsukushigahara, 29. viii. 1962 (H. Suda, ELKU). Toyama Pref.: 1 female, Midagahara, Mt. Tateyama, 26. vii. 1988 (H. Negoro, SCMH). Gifu Pref.: 1 female, Akigami, 21. viii. 1978 (Y. Morimoto, ELKU).

[**AUSTRIA**] 4 females, Tirol, 1440m, Fiss, 47°03' 10° 37', 20. vii. 1992 (J. Gusenleitner, OLML); 4 males, Tirol/Seiser-Alp, 2000m, 14. x. 1972 (K. Warncke, OLML); 1 male, 1km, SW Salzburg-Aigen, 47°46' 13° 06', 27. vii. 1993 (M. Schwarz, OLML); 9 males, Karnten, 430m, St. Stefan, 46°48' 14°51', 21. viii. 1989 (J. Gusenleitner, OLML). [**BULGARIA**] 1 female, nent. Pirin m. ecc., 1000-1500m, 4. viii. 1982 (J. Halada, OLML); 9 males, mer. Or. Primorsko env., 29. vii-10. viii. 1988 (P. Tyrner, OLML). [**PORTUGAL**] 3 females, Amarante, 2. v. 1990 (A. Roth, OLML). [**FRANCE**] 5 females, Auvergne Royat, W Clermont-Ferrand, 12. vii. 1984 (J. Gusenleitner, OLML). [**ITALY**] 6 females, Toscana, Torricella (SI), 10km, NW Acquapendente, 6. vi. 1991 (J. Gusenleitner, OLML). [**TURKEY**] 3 males, Ardahan/Kars, 2. ix. 1973 (K. Warncke, OLML). [**RUSSIAN FAR EAST**] 1 male, Sakhalin (K. Tamanuki, ELKU). Kurile IsIs.: 1 female and 2 males, Rubetu, Etorohu Is., 28. viii. 1940 (S. Kuwayama & Y. Sugihara, ELKU); 4 males, Sibetoru, Etorohu Is., 6-7. ix. 1940 (S. Kuwayama & Y. Sugihara, ELKU); 1 female and 1 male, Syana, Etorohu Is., 3. ix. 1940 (S. Kuwayama & Y. Sugihara, ELKU); 2 males, Tosimoe, Etorohu Is., 29-30. viii. 1940 (S. Kuwayama & Y. Sugihara, ELKU); 1 female, Nakanokotan, Kunashiri Is., 16-17. viii. 1940 (S. Kuwayama & Y. Sugihara, ELKU); 2 females, Timonizi, Kunashiri Is., 5-6. viii. 1940 (S. Kuwayama & Y. Sugihara, ELKU); 4 females, Timonizi-Pondomari, Kunashiri Is., 9. viii. 1940 (S. Kuwayama & Y. Sugihara, ELKU); 1 female, Tofutu, Kunashiri Is., 17-18. viii. 1940 (S. Kuwayama & Y. Sugihara, ELKU); 2 females, Shakotan, Sikotan Is., 26-27. vii. 1940 (S. Kuwayama & Y. Sugihara, ELKU).

Lasioglossum (Evylaeus) calceatum (Scopoli, 1763)

(Figs. 15. A-L; 16. A-I; 17. A-D; 56. D; 58. D)

Apis calceata Scopoli, 1763, Entomol. Carn. : 301 [male, type locality unknown].

Hylaeus cylindricus Fabricius, 1793, Entomol. syst., 2: 302-303 [female, Germany].

Melitta fulvocincta Kirby, 1802, Monogr. Apum Angl., 2: 68-71, [female & male, England: Barhamiae].

Melitta obovata Kirby, 1802, Monogr. Apum Angl., 2: 75 [female, England: Barhamiae].

Andrena vulpina Fabricius, 1804, nec (Christ 1791), Syst. Piez., : 326 [female, Germany].

Halictus terebrator Walckenaer, 1817, Mém. Hist. nat. abeill. solit., : 72-79 [female & male, north France: Touteville].

Hylaeus bipunctatus Schenck, 1853, Jahr. Ver. Naturk. Herzogth. Nassau, 9 (1): 160-161 [male, type locality unknown].

Halictus cylindricus var. *rhodostomus* Dalla Torre, 1877, Ztschr. Ferdinand. Tirol., (3) 21: 180 [male, Italy: Trento].

Halictus calceatus ulterior Cockerell, 1929, Ann. Mag. Nat. Hist., (10) 4: 588 [female & male, Russia: Siberia].

Halictus calceaus: Dalla Torre, 1896, Cat. Hym., 10: 56; Cockerell, 1924, Ann. Mag. Nat. Hist., (9)14: 582 [in list, female]; Blüthgen, 1924, Konowia, 3 (2/3): 93; (4/6): 274 [in key], 275 [notes]; Cockerell, 1925, Proc. U. S. Nat. Mus., 68 (2607): 4 [in key, female]; Hirashima, 1957, Sci. Bull. Fac. Agr., Kyushu Univ., 16 (1): 5.

Lsioglossum (Evylaeus) calceatum: Ebmer, 1971, Naturk. Jahrb. Stadt Linz, 1971: 93; Sakagami & Munakata, 1972, J. Fac. Sci., Hokkaido Univ., Ser. VI, Zool., 18: 411-412 [diagnosis]; Ebmer, 1974, Israel. J. Entomol, 9: 184; Ebmer, 1978a, Ann. Hist.-nat. Mus. Nat. Hung., 70: 314; Ebmer, 1978b, Bonn. zool. Beitr., 29 (1-3): 200-201; Ebmer, 1982, Mitt. zool. Mus. Berlin, 58 (2): 211.

Lasioglossum (Evylaeus) calceatum calceatum: Ebmer, 1988, Linzer biol. Beitr., 20 (2): 597; Ebmer, 1995, Linzer biol. Beitr., 27 (2): 530; Ebmer, 1996, Linzer biol. Beitr., 28 (1): 278; Ebmer, 2006, Linzer biol. Beitr., 38 (1): 555.

Redescription

Female. Body length 7.7–9.5 mm, wing length 6.6–7.9 mm (n= 5).

Color. Body black except as follows: mandible with apical half reddish brown; flagellum beneath blackish brown; tegula posteriorly and marginally brownish semitransparent; tibial spur yellow; posterior margins of metasomal terga broadly yellowish brown semitransparent. Wings nearly transparent; veins yellowish brown to brown; pterostigma brown.

Pilosity. Body hairs dull whitish to pale yellowish brown. Hairs on head finely branched, moderately dense. Hairs on mesosoma finely branched except as follows: lateral lobe of pronotum and medial area of metanotum with dense tomentose; hind trochanter and femur with plumose hairs, forming scopa. Hairs on anterior and lateral portions of T_1 finely branched, sparse. T_{2-4} with simple and short hairs on disc, and laterally with moderately dense fine branched hairs. Hairs on T_5 finely branched, moderately dense. Basal hair bands present on T_{2-4}, and covering over the basal area of T_{2-3}.

Structure. Head shape variable; head length/width ratio 0.96-1.27 (n= 10). Vertex medially flat, behind ocelli with transverse ridges. Distance between lateral ocelli slightly longer or as long as the distance between lateral ocellus and compound eye. Frons and paraocular areas dimly shiny or weakly shiny, with cancellate PP (20-30 μø). Supraclypeal area (Figs. 15. C; 16. A) slightly convex in lateral view, weakly shiny, with moderately dense granular PP (20-25 μø); IS weakly reticulate. Clypeal length about 1.3 times the distance between lower rim of antennal socket and upper margin of clypeus. Clypeus nearly flat in lateral view, weakly shiny, with moderately dense granular PP (20-25 μø) and IS with weak reticulation on upper half, with sparse larger shallow PP (30-40 μø) and IS without reticulation on lower half. Basal area of labrum about 2.4 times as wide as long; basal elevation well developed; lateral projection of distal process well developed, rounded; keel of distal process moderately broad, apically bluntly pointed in frontal view; labral fimbria all acutely pointed at apex. Mandible bidentate. Hypostomal carina well developed; its anterior angle obtuse. Postgena nearly smooth. Scape length 0.9-1.1 mm (n= 5), F_1 length about 1.3 times F_2.

Pronotum with dorsolateral angle obtuse; lateral sulcus distinct. Mesoscutum (Fig. 15. D, E) moderately shiny, anteriorly, medially and marginally with dense granular PP (20-35 μø), and medially and posteriorly with moderately dense granular PP (20-35 μø); IS anteriorly with distinct reticulation, medially and posteriorly without reticulation. Mesoscutellum (Fig. 15. F) weakly shiny, medially weakly depressed, sculpture similar to mesoscutum. Metanotum rugulose. Mesepisternum (Fig. 16. C) coarsely rugulose. Metepisternum with transverse ridges on upper half, with weak rugulae on lower half. Propodeum: the length of propodeal dorsum shorter than that of mesoscutellum, and about 1.2 times that of metanotum; propodeal dorsum (Fig. 16. D) with irregular sinuate ridges over the surface; transverse carina weak; oblique carinae connected with transverse carina at upper ends; propodeal side rugulose; shield reticulate. Basitibial plate of hind leg marginally carinate. Inner hind tibial spur (Fig. 16. E) with 8-12 small teeth (n= 20).

Metasomal terga weakly shiny, rather enamel-like luster. T_1 (Fig. 56. D) medially with sparse granular PP (15-20 μø), and posterior margin with weak transverse striation. T_2 basally and medially with moderately dense granular PP (15-20 μø), and basally and posteriorly with weak transverse striation. T_{3-4} with moderately dense pores and with weak transverse striation over the surface.

Male. Body length 7.8–8.9 mm, wing length 6.6–7.2 mm (n= 5).

Color. Similar to female except as follows: lower half of clypeus yellow; all tibiae basally and apically yellow; all tarsi yellow to yellowish brown.

Pilosity. Similar to female except as follows: lower paraocular area, supraclypeal area, and upper half of clypeus with dense tomentose; hairs on metanotum finely branched, sparse; hairs on hind trochanter and femur with sparse fine branched hairs; hairs on T_1 medi-

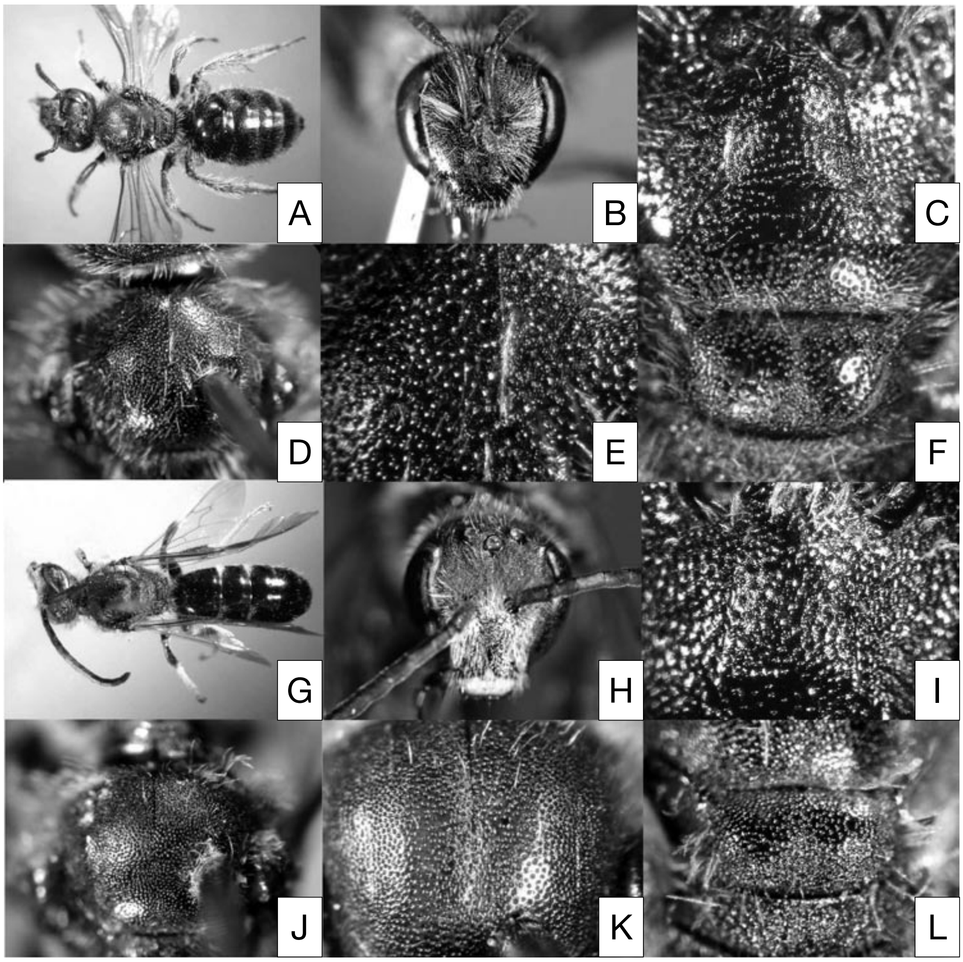

Fig. 15. *Lasioglossum (Evylaeus) calceatum* (Scopoli). A-F: female. G-L: male. A, G: general habitus. B, H: head in frontal view. C, I: supraclypeal area. D, J: mesoscutum. E, K: sculpture of mesoscutum. F, L: mesoscutellum.

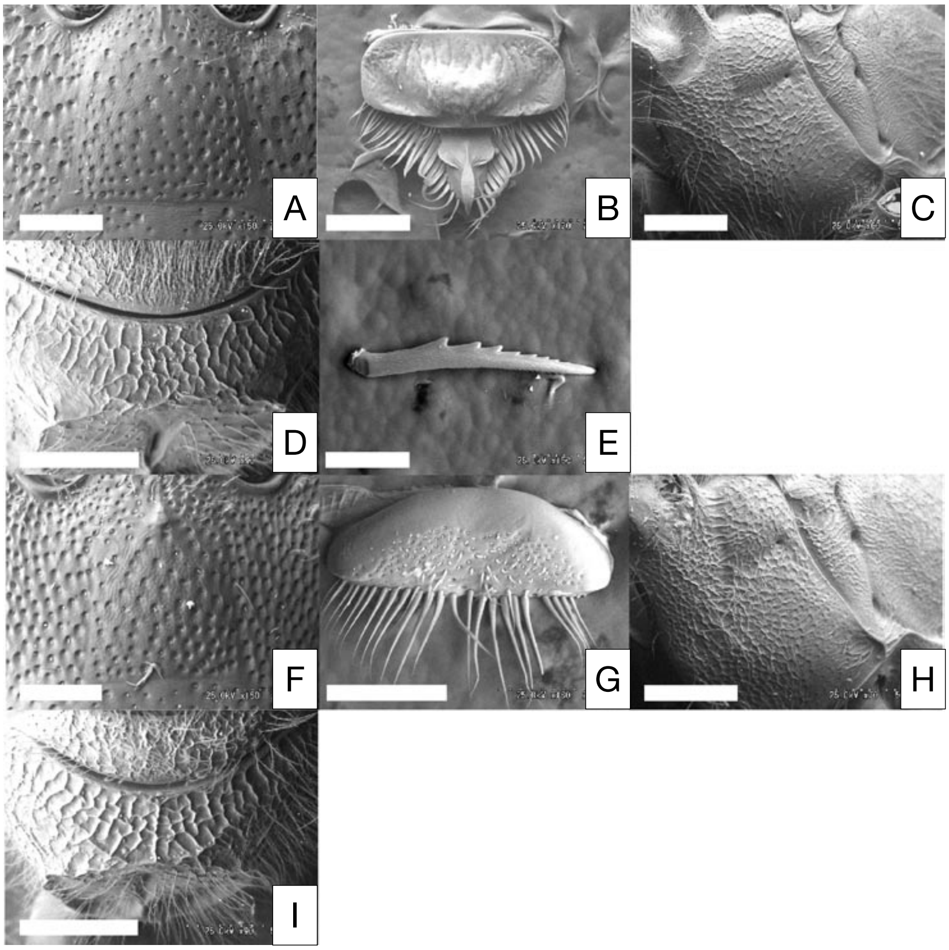

Fig. 16. *Lasioglossum (Evylaeus) calceatum* (Scopoli). A-E: female. F-I: male. A, F: supraclypeal area. B, G: labrum. C, H: mesepisternum. D, I: propodeal dorsum. E: inner hind tibial spur. Scale: C, D, H, I, 0.5mm; B, G, 0.25mm; A, E, F, 0.2mm.

ally and posteriorly simple and short, moderately dense; basal hair bands present on T_{2-3}, and covering over the basal area.

Structure. Similar to female except as follows.

Head length distinctly longer than head width; head length/width ratio 1.08-1.15 (n= 10). Vertex behind ocelli weakly rugulose. IS of supraclypeal area with distinct reticulation. Clypeus medially gently convex in lateral view. Basal area of labrum about 2.7 times as wide as long; basal elevation and distal process absent. Mandible edentate. Scape length 0.4–0.5 mm (n= 5), F_2 length about 1.8 times F_1.

Mesoscutum (Fig. 15. J, K) duller than in female, with cancellate PP (20-35 μø) over the surface or dense granular PP excluding the apical area; IS anteriorly and medially with weak reticulation, and posteriorly without reticulation. The sculptures of metanotum coarser than in female. Propodeum: the length of propodeal dorsum slightly longer than that of metanotum; propodeal dorsum (Fig. 16. I) with coarse sinuate ridges over the surface. Basitibial plate of hind leg marginally without carina. Inner hind tibial spur without distinct teeth.

T_1 (Fig. 58. D) medially and posteriorly with dense granular PP (15-20 μø), and posterior margin with weak transverse striation. T_{2-3} basally and medially with dense granular PP (15-20 μø), and posteriorly with weak transverse striation. S_7 with long or broad, apically rounded median process; S_8 with moderately long, apically rounded median process (Fig. 17. D).

Male genitalia (Fig. 17. A-C). Gonobasal ventral arm ring-shaped, and not connected with each other at upper ends in ventral view; the bottom nearly flat. The surface of gonocoxite smooth. Gonostylus (Fig. 17. C) with moderately dense pores and sparse short hairs. Ventral retrorse lobe absent.

Variation. The coloration of the metasoma presents black and partly pale red types in both sexes. In male, the coloration of labrum shows brown and yellow types.

In the Japanese population, the coloration of metasoma and labrum is entirely black.

Remarks. This species is divided into three subspecies based on coloration of the metasoma (Ebmer, 1995): ssp. *calceatum* occurring from Europe to Japan, ssp. *rubens* (Smith) from Central Asia, and ssp. *reinigi* Ebmer from Middle East. According to the comments by Pesenko *et al.* (2000), it is impossible to distinguish them as separate subspecies, because red and dark-colored individuals so widely and commonly spread in Eurasian steppes. We share the opinion of Pesenko *et al.* (2000).

In Japan, this species is closely similar to *Lasioglossum (Evylaeus) duplex* (Dalla Torre). As to the differences between *L. (E.) calceatum* and *L. (E.) duplex*, see Sakagami & Munakata (1972). Also, this species is relatively similar to *L. (E.) affine* (Smith), but can be separated from it by the shorter distance between vertex and posterior ocelli [*L. (E.) calceatum*, 0.1-0.18 mm; *L. (E.) affine*, 0.23-0.3 mm] in female, the F_2 length about 1.8 times F_1 in male, the IS of mesoscutum posteriorly without reticulation in female, the T_1 medially with sparse PP and without distinct striation in female, and the shape of gonostylus.

Distribution. Transpalearctic: from Europe to eastern Asia. In Asia, this species is recorded from the following localities: Uzbekistan (Samarkand), Kazakhstan, Kyrgyzstan (Talas), China (Xinjiang Uygur), Russian Far East (Siberia, Kamchatka, Sakhalin, Primorsky), Korean Peninsula.

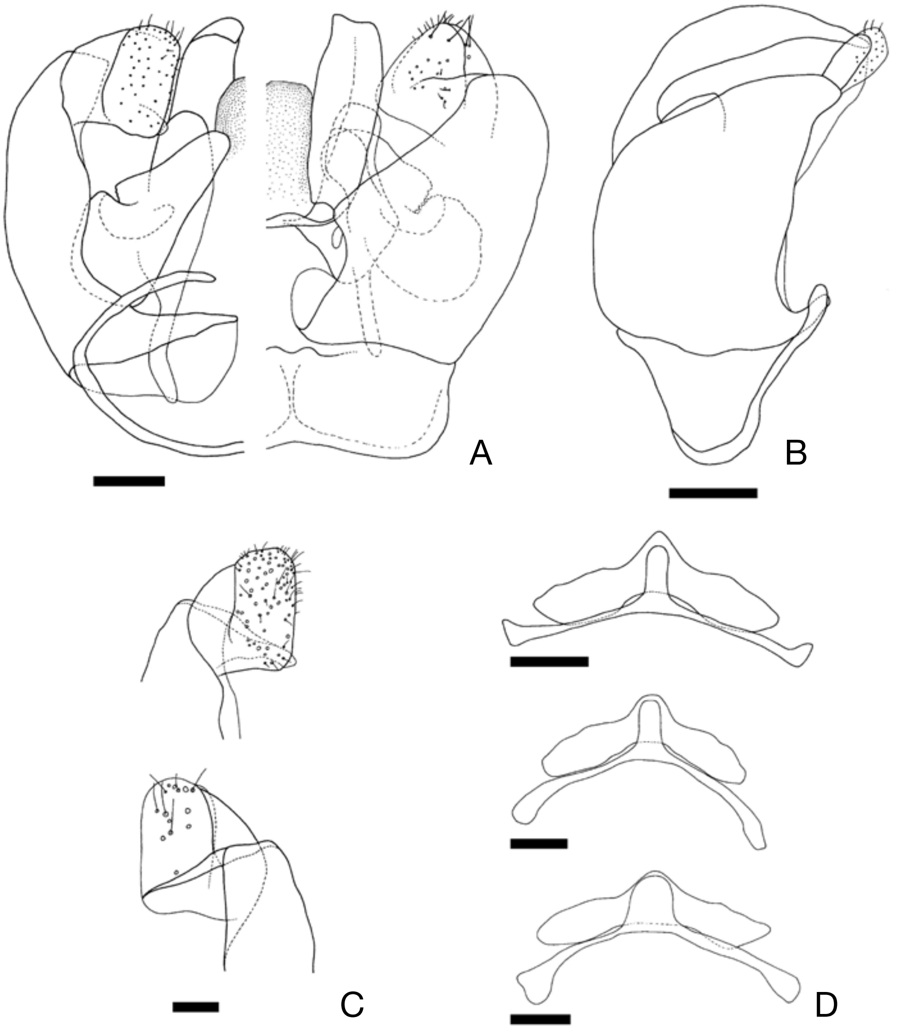

Fig. 17. *Lasioglossum (Evylaeus) calceatum* (Scopoli). A-C: male genitalia. D: $S_{7\text{-}8}$. A: left, ventral view; right, dorsal view. B: lateral view. C: gonostylus (upper, ventral view; lower, dorsal view). Scale: A, B, 0.2mm; C, 0.1mm; D, 0.25mm.

In Japan, this species is recorded from Hokkaido, northern part of Honshu, and Kyushu. However, we could not recognize from Honshu and Kyushu in this study. We think that the distribution of Japanese population may be restricted in Hokkaido. It will be needed for detailed study of distributional range in future.

Flight records. Female: May to August. Male: late July to October.

Biology. See Sakagami & Munakata (1972).

Specimens examined. [**JAPAN**] [**Hokkaido**] 5 females, Ashibetsu-ko, Ashibetsu 22. v. 1984 (O. Tadauchi, ELKU); 13 females, Erimo, Erimo-machi, Hidaka-gun, 31. v. 1975 (O. Tadauchi, ELKU); 1 female, Ginsendai, Mt. Daisetsu, 16. viii. 1984 (O. Tadauchi, ELKU); 2 females, Hichikenho, 4. viii., 12. viii. 1984 (T. Tano, ELKU); 8 females and 20 males, Kabuka, Rebuntou, 19. viii. 1984 (O. Tadauchi, ELKU); 4 females, Kiritappu, Highmoor E., 1972 (Y. Uehira, SCMH); 1 female and 1 male, Moiwa, 23. v., 26. ix. 1972 (Kawano, ELKU); 10 males, Wakkanai-kûkou, 16. viii. 1984 (O. Tadauchi, ELKU); 1 male, Mt. Teine, Sapporo, 23. ix. 1970 (S. F. Sakagami, SCMH); 1 male, Nishiashoro, 8. viii. 1955 (Y. Hirashima, ELKU); 4 males, Nosappumisaki, Nemuro, 13. ix. 1984 (O. Tadauchi, ELKU); 2 males, Okusawa, Otaru, 26. ix. 1970 (S. F. Sakagami, SCMH); 1 male, Shiribeshi-gun, 2. ix. 1984 (O. Tadauchi, ELKU); 1 male, Yoroushi, Nemuro, 19-20. ix. 1959 (R. Ishikawa & F. Ishikawa, SCMH); 4 females, Mt. Hakuun-dake, 16-17. vii. 2004 (ELKU); 1 male, Kami-Otoineppu, Nakagawa Exp. For., 5. ix. 1970 (S. F. Sakagami & H. Fukuda, SCMH).

[**AUSTRIA**] 1 female, O. O. Stelzen, 12. v. 1985 (Tiefenthaler, OLML); 1 female, Tirol, 2400m, Schönjöchl, NW Fiss 47°05'10°36', 24. vii. 1992 (J. Gusenleitner, OLML); 1 female, Linz, Dornogoh, 19. iv. 1965 (J. Gusenleitner, OLML); 1 male, Oberösterreich, Wegscheid b. Linz, 24. viii. 1962 (H. Hamann, OLML); 2 males, S. Salzburg, 47°42'13°03', 15. ix. 1994 (M. Schwarz, OLML); 1 male, Linz, 7. x. 1962 (J. Gusenleitner, OLML). [**PORTUGAL**] 1 female, Ordem, 14km, SE Amarante, 4. v. 1990 (F. Gusenleitner, OLML). [**ITALY**] 1 female, Gebiet, M. Pollino, 10km, N. Autobahnabf, Campotenese ca 1500m, 30. viii. 1987 (F. Gusenleitner, OLML); 1 male, Studena-alta, b. Pontebba, 23. vii. 1982 (J. Gusenleitner, OLML). [**KAZAKHSTAN**] 1 female, Kaptzagai, 100km, N. Alma-Ata, 18. vi. 1995 (M. Múcka, OLML). [**KYRGYZSTAN**] 1 female, Talasskaya, Kara-Bura, 42°40'N/72°10'E, 1750-1900m, 9-12. vi. 1996 (H. Rausch, OLML).

Lasioglossum (Evylaeus) duplex (Dalla Torre, 1896)

(Figs. 18. A-L; 19. A-I; 20. A-D; 56. E; 58. E)

Halictus familiaris Smith, 1879, nec (Erichson, 1841), Descr. New Spec. Hym.,: 31 [female, Japan: Hakodate]; Blüthgen, 1924, Konowia, 3 (4/6): 284 [in list]; Yasumatsu, 1935, Fukuoka Hakubutsugaku Zasshi, 1: 385 [in list, female].

Halictus duplex Dalla Torre, 1896, Cat. Hym., 10: 61 [new name for *H. familiaris* Smith]; Cockerell, 1909, Ann. Mag. Nat. Hist., (8) 4: 316 [in key, female]; Tosawa, 1932, List Ins. Minoo Park, Osaka: 101; Hirashima, 1957, Sci. Bull. Fac. Agr., Kyushu Univ., 16 (1): 7.

Halictus leoninus Vachal, 1903, Bull. Mus. Hist. Nat. (Paris), 9: 130 [female, Japan]; Blüthgen, 1930, Mitt. Deutsch. entomol. Gesell., 1 (5): 71.

Halictus rimalis Pérez, 1905, Bull. Mus. Hist. Nat. (Paris), 11: 36 [female, Japan]; Blüthgen, 1926, Deutsch. entomol. Zeitschr., 1926 (4): 349.

Halictus angularis Pérez, 1905, Bull. Mus. Hist. Nat. (Paris), 11: 36 [female, Japan: Yokohama]; Blüthgen, 1926, Deutsh. entomol. Zeitschr., 1926 (4): 349.

Halictus constrictus Matsumura, 1912, nec Smith 1853, Thous. Ins. Jap., Suppl., IV: 206 [female, Japan: Honshu].

Halictus matsumurai Hirashima, 1957, Sci. Bull. Fac. Agric., Kyushu Univ., 16: 12 [new name for *H. constrictus* Matsumura].

Lasioglossum (Evylaeus) duplex (Dalla Torre): Sakagami & Munakata, 1972, J. Fac. Sci. Hokkaido Univ., Ser. VI, Zool., 18: 411-412 [diagnosis, female & male]; Ebmer, 1995, Linzer biol. Beitr., 27 (2): 531.

Redescription

Female. Body length 7.6–9.2 mm, wing length 7.3–7.6 mm (n= 5).

Color. Body black except as follows: mandible with apical half reddish brown; flagellum beneath blackish brown; tegula posteriorly and marginally brownish semitransparent; tibial spur yellow; posterior margins of metasomal terga broadly yellowish brown or blackish brown semitransparent. Wings nearly transparent; veins yellowish brown or brown; pterostigma blackish brown.

Pilosity. Body hairs dull whitish to pale yellowish brown. Hairs on head finely branched, moderately dense. Hairs on mesosoma finely branched except as follows: lateral lobe of pronotum and medial area of metanotum with dense tomentose; hind trochanter and femur with plumose hairs, forming scopa. Hairs on anterior and lateral portions of T_1 finely branched, sparse. Hairs on $T_{2\text{-}4}$ simple and short on disc, and laterally with moderately dense fine branched hairs. Hairs on T_5 finely branched, moderately dense. Basal hair bands present on $T_{2\text{-}4}$, and covering over the basal area of $T_{2\text{-}3}$.

Structure. Head shape variable; head length/width ratio 0.98-1.3 (n= 10). Vertex medially flat, behind ocelli with transverse ridges. Distance between lateral ocelli slightly longer or as long as the distance between lateral ocellus and compound eye. Frons and paraocular areas dimly or weakly shiny, with cancellate PP (20-30 μø). Supraclypeal area (Figs. 18. C; 19. A) slightly convex in lateral view, dimly shiny, with dense granular PP (20-30 μø); IS with distinct reticulation. Clypeal length about 1.2 times the distance between lower rim of antennal socket and upper margin of clypeus. Clypeus nearly flat in lateral view, dimly or weakly shiny, with moderately dense granular PP (20-30 μø) and IS with distinct reticulation on upper half, with sparse shallow PP (30-40 μø) and IS without reticulation on lower half. Basal area of labrum about 2.3 times as wide as long; basal elevation well developed; lateral projection of distal process well developed, rounded; distal keel of distal process moderately broad, apically pointed in frontal view; labral fimbria all acutely pointed at apex. Mandible bidentate. Hypostomal carina well developed; its anterior angle obtuse. Postgena nearly smooth. Scape length about 1.0 mm (n= 5), F_1 length about 1.1 times or as long as F_2.

Pronotum with dorsolateral angle obtuse; lateral sulcus distinct. Mesoscutum (Fig. 18. D, E) dimly shiny, anteriorly, medially and marginally with dense granular PP (20-30 μø), and posteriorly with moderately dense granular PP (20-30 μø); IS anteriorly and medially with distinct reticulation, and posteriorly with weak reticulation or without reticulation. Mesoscutellum (Fig. 18. F) dimly shiny, medially weakly depressed, marginally and

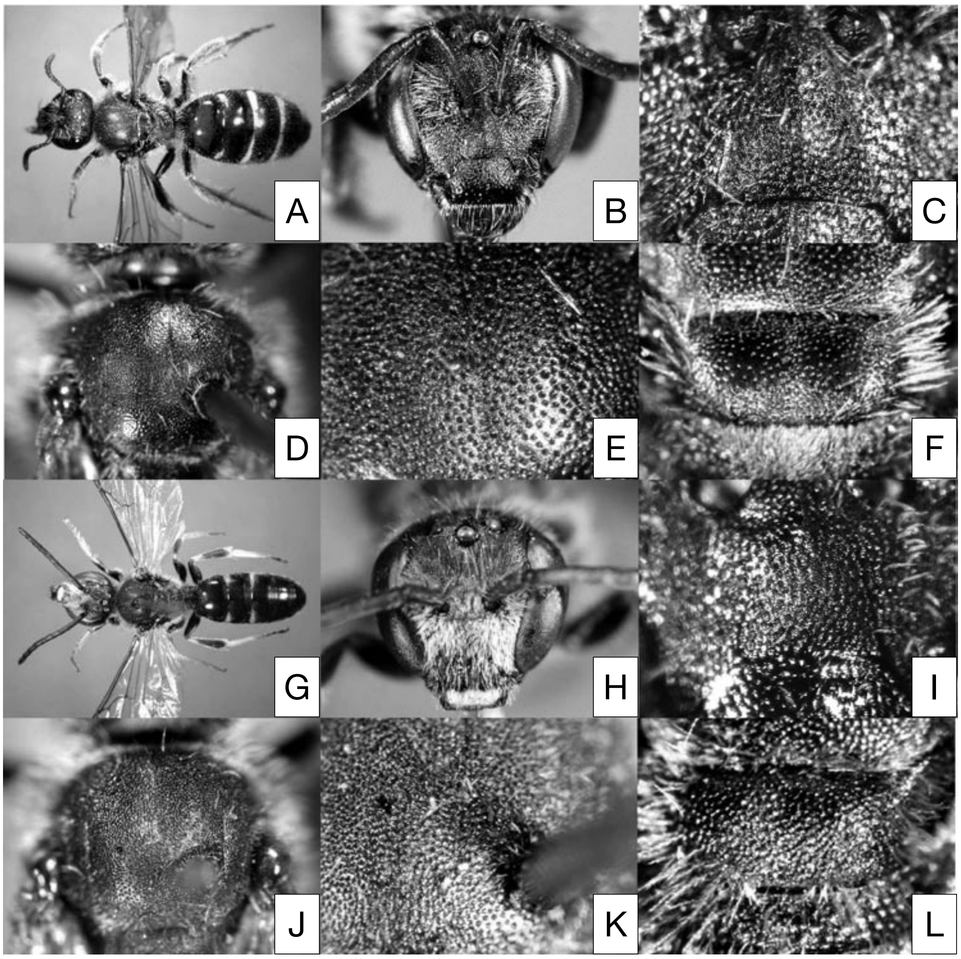

Fig. 18. *Lasioglossum (Evylaeus) duplex* (Dalla Torre). A-F: female. G-L: male. A, G: general habitus. B, H: head in frontal view. C, I: supraclypeal area. D, J: mesoscutum. E, K: sculpture of mesoscutum. F, L: mesoscutellum.

longitudinally with homogeneous PP and IS in sculpture similar to mesoscutum. Metanotum rugulose. Mesepisternum (Fig. 19. C) coarsely rugulose. Metepisternum with transverse ridges on upper half, with weak rugulae on lower half. Propodeum: the length of propodeal dorsum shorter than that of mesoscutellum, and about 1.3 times that of metanotum; propodeal dorsum (Fig. 19. D) with irregular sinuate ridges over the surface; transverse carina weak; oblique carinae connected with transverse carina at upper ends; propodeal side rugulose; shield reticulate. Basitibial plate of hind leg marginally carinate. Inner hind tibial spur (Fig. 19. E) with 8-12 small teeth (n= 30).

Metasomal terga somewhat dimly shiny. T_1 (Fig. 56. E) medially with sparse fine PP (≦10 μø) (rather obscure PP), and posteriorly with very weak transverse striation. T_2 with moderately dense pores over the surface, basally and posteriorly with very weak transverse striation. $T_{3\text{-}4}$ with moderately dense pores and weak transverse striation over the surface.

Male. Body length 8.4–9.4 mm, wing length 6.9–8.0 mm (n= 5).

Color. Similar to female except as follows: lower half of clypeus yellow; fore and middle tibiae basally yellow, and apically slightly yellow; hind tibia basally and apically yellow; all tarsi yellow to yellowish brown; posterior margins of metasomal terga narrowly brownish or blackish semitransparent.

Pilosity. Similar to female except as follows: paraocular and supraclypeal areas with dense tomentose; hairs on metanotum finely branched, sparse; hairs on hind trochanter and femur with sparse fine branched hairs; hairs on T_1 medially and posteriorly simple and short, moderately dense; basal hair bands indistinct.

Structure. Similar to female except as follows.

Head length distinctly longer than head width; head

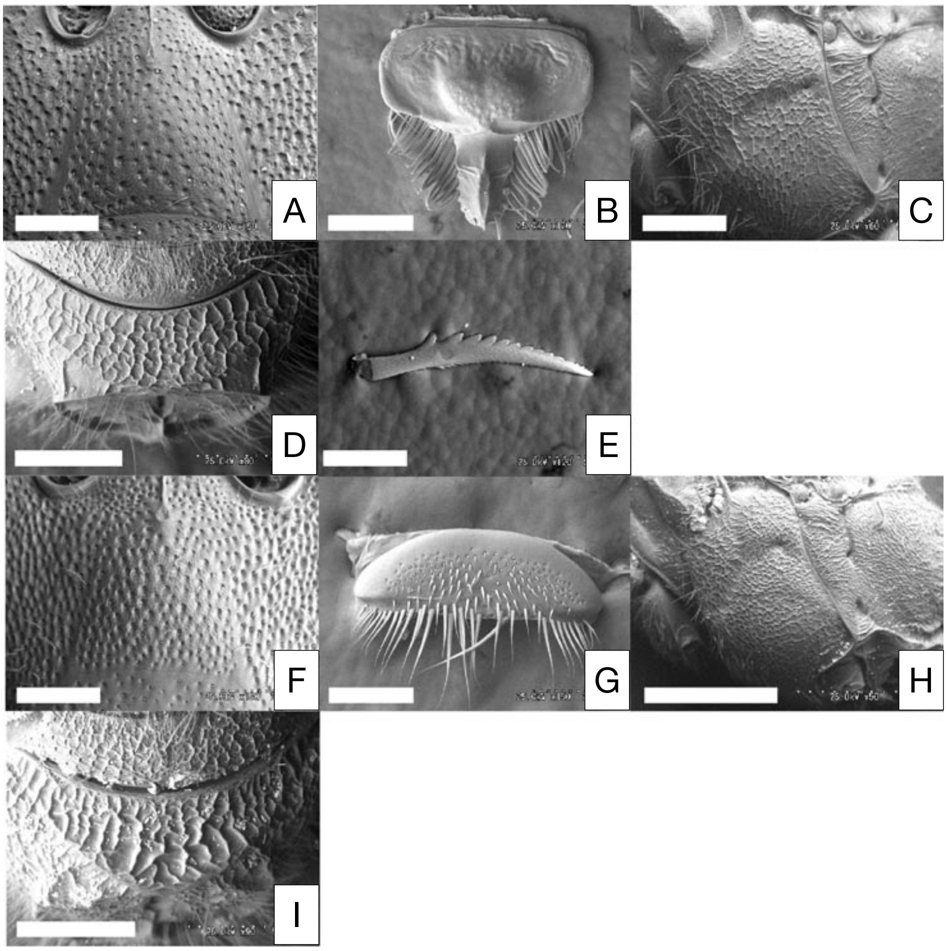

Fig. 19. *Lasioglossum (Evylaeus) duplex* (Dalla Torre). A-E: female. F-I: male. A, F: supraclypeal area. B, G: labrum. C, H: mesepisternum. D, I: propodeal dorsum. E: inner hind tibial spur. Scale: H, 1mm; C, D, I, 0.5mm; B, E, 0.25mm; A, F, G, 0.2mm.

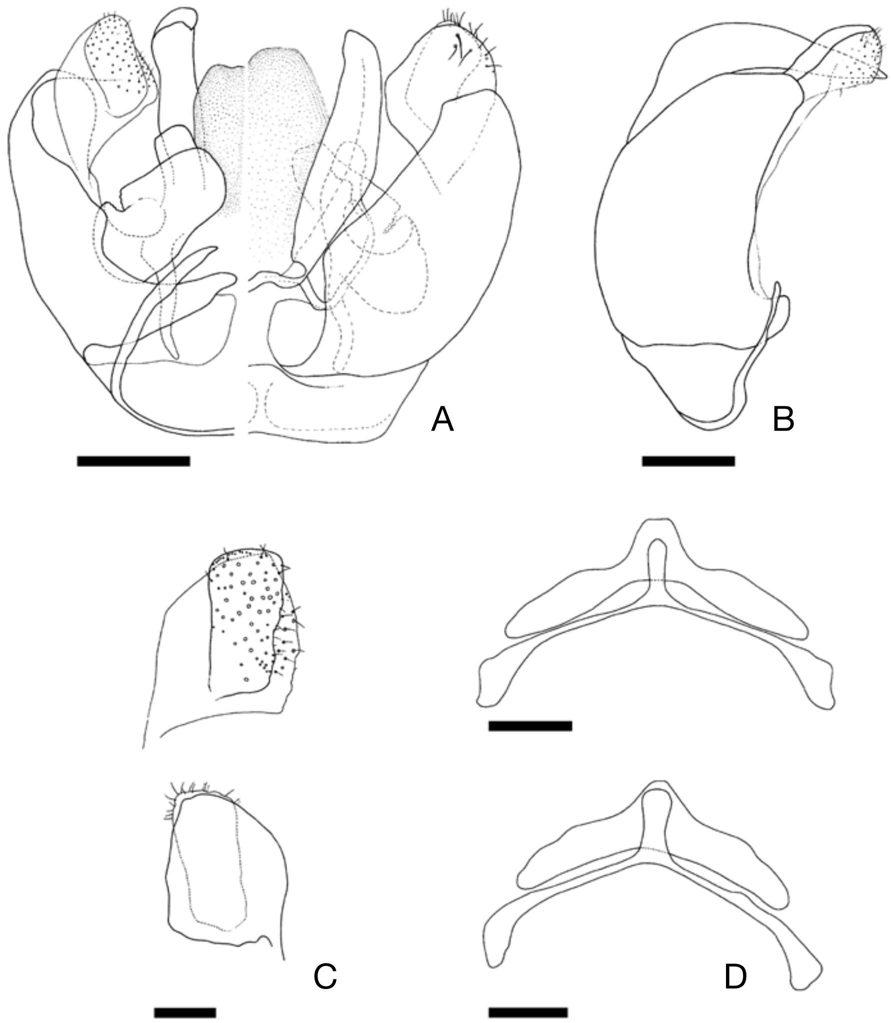

Fig. 20. *Lasioglossum (Evylaeus) duplex* (Dalla Torre). A-C: male genitalia. D: S_{7-8}. A: left, ventral view; right, dorsal view. B: lateral view. C: gonostylus (upper, ventral view; lower, dorsal view). Scale: D (lower), 0.5mm; D (upper), 0.25mm; A, B, 0.2mm; C, 0.1mm.

length/width ratio 1.05-1.08 (n= 10). Vertex behind ocelli weakly rugulose. Clypeal length about 1.5 times the distance between lower rim of antennal socket and upper margin of clypeus. Clypeus medially gently convex in lateral view. Basal area of labrum about 3 times as wide as long; basal elevation and distal process absent. Mandible edentate. Scape length 0.5-0.6 mm (n= 5), F_2 length about 1.9 times F_1.

Mesoscutum (Fig. 18. J, K) dimly shiny, with cancellate PP (20-30 μø) over the surface, IS distinctly reticulate over the surface. Mesoscutellum (Fig. 18. L) medially distinctly depressed, with cancellate PP (20-35 μø); IS distinctly reticulate. The sculptures of metanotum coarser than in female. Propodeal dorsum (Fig. 19. I) with coarse sinuate ridges over the surface. Basitibial plate of hind leg marginally without carina. Inner hind tibial spur without distinct teeth.

T_1 (Fig. 58. E) medially with moderately dense granular PP (15-20 μø), and posteriorly with very weak transverse striation. T_2 with weak transverse striation over the surface, basally and medially with moderately dense granular PP (15-20 μø). T_{3-4} with moderately dense pores and weak transverse striation over the surface. S_7 with long, apically rounded median process; S_8 with moderately long, apically truncate median process (Fig. 20. D).

Male genitalia (Fig. 20. A-C). Gonobasal ventral arm triangle, and not connected with each other at upper ends in ventral view; the bottom nearly flat. The surface of gonocoxite smooth. Gonostylus (Fig. 20. C) with moderately dense pores and sparse short hairs. Ventral retrorse lobe absent.

Variation. See Sakagami & Munakata (1972).

Remarks. In Japan, this species is closely similar to *Lasioglossum (Evylaeus) calceatum* (Scopoli). As to the differences between *L. (E.) duplex* and *L. (E.) calceatum*, see Sakagami & Munakata (1972). Also, this species is relatively similar to *L. (E.) affine* (Smith), but can be separated from it by the shorter distance between vertex and posterior ocelli [*L. (E.) duplex*, 0.1-0.18 mm; *L. (E.) affine*, 0.23-0.3 mm] in female, the F_2 length about 1.9 times F_1 in male, the T_1 medially with sparse PP and without distinct striation in female, and the shape of gonostylus.

Distribution. **Korean Peninsula (south)= new record**, Japan (Hokkaido, Honshu, Izu Islands, Shikoku, Kyushu, Tsushima).

Flight records. Female: April to October. Male: July to September.

Biology. See Sakagami & Hayashida (1958, 1960, 1961, 1968), Sakagami & Fukuda (1972a, 1989), Sakagami (1977), Sakagami *et al.* (1984), Gôukon *et al.* (1986), Hirata *et al.* (2005).

Specimens examined. Holotype, female, Japan (NHML). *Other material.* [**JAPAN**] We have examined 278 females and 34 males from the following localities in Japan: Hokkaido, Aomori, Miyagi, Yamagata, Tochigi, Ibaraki, Saitama, Chiba, Tokyo, Yamanashi, Niigata, Fukui, Toyama, Ishikawa, Nagano, Gifu, Kyoto, Tottori, Hiroshima, Yamaguchi, Ehime, Kochi, Oita, Kumamoto, Miyazaki Prefectures. Some of the specimens examined are listed as follows: [**Hokkaido**] 8 females, Botanical Garden, Sapporo, 21. iv., 22. iv., 7. v., 8. vii., 14. vii. 1959 (S. F. Sakagami, SCMH); 1 male, University Campus, Sapporo, 5. vii. 1959 (S. F. Sakagami, SCMH); 2 males, Sapporo, 13. viii. 1953 (Y. Hirashima, ELKU). [**Honshu**] Miyagi Pref.: 1 female and 1 male, Rifu-cho, 7. v. 1976, 25. ix. 1977 (K. Goukon, SCMH). Fukui Pref.: 1 female, Asahi, Izumi-mura, 14. v. 2004 (T. Sugimoto). Ibaraki Pref.: 1 female, Mt. Yamizo, 31. x. 1978 (H. Ishii, SCMH). [**Shikoku**] Kochi Pref.: 2 females, Tanono, Taisho-machi, 16. iv. 1976 (O. Tadauchi, ELKU). [**Kyushu**] Oita Pref.: 1 female, Kokonoe-cho, Chojyabaru, 12. ix. 2004 (T. Sugimoto). Kumamoto Pref.: 1 female, Aso-machi, Aso-gun, 24. vi. 2001 (A. Yamada, ALKK). Miyazaki Pref.: 1 female, Miyakonojô, 7. iv. 1949 (Y. Hirashima, SCMH).

[**SOUTH KOREA**] 1 female, JeongLyongChy, SanNaeMeon, NamWeonGun, Cheon-LaBukDo, 14. v. 1991 (O. Tadauchi, ELKU).

Lasioglossum (Evylaeus) nipponense (Hirashima, 1953)

(Figs. 21. A-L; 22. A-I; 23. A-D; 56. F; 58. F)

Halictus nipponensis Hirashima, 1953, Trans. Shikoku Entomol. Soc., 3: 134-135 [female, Japan: Ehime Pref.]; Hirashima, 1957, Sci. Bull. Fac. Agr., Kyushu Univ., 16 (1): 13.

Lasioglossum (Evylaeus) nipponense: Ebmer, 1995, Linzer biol. Beitr., 27 (2): 534-536 [male, description]; Ebmer, 1996, Linzer biol. Beitr., 28 (1): 279; Ebmer, 2006, Linzer biol. Beitr., 38 (1): 556.

Redescription

Female. Body length 7.8–9.0 mm, wing length 7.7–9.2 mm (n= 5).

Color. Body black except as follows: mandible with apical half reddish brown; flagellum beneath blackish brown or brown; tegula posteriorly and marginally brownish semitransparent; tibial spur yellow; posterior margins of metasomal terga broadly yellowish brown semitransparent. Wings nearly transparent; veins yellowish brown to brown; pterostigma blackish brown.

Pilosity. Body hairs dull whitish to yellowish brown. Hairs on head finely branched, sparse. Hairs on mesosoma finely branched except as follows: lateral lobe of pronotum and medial area of metanotum with dense tomentose; hind trochanter and femur with plumose hairs, forming scopa. Hairs on anterior and lateral portions of T_1 finely branched, sparse. Hairs on T_{2-4} simple and short on disc, and laterally with finely branched hairs. Basal hair bands present on T_{2-4}.

Structure. Head length distinctly longer than head width; head length/width ratio 1.07-1.09 (n= 10). Vertex behind ocelli with weak transverse ridges. Distance between lateral ocelli as long as the distance between lateral ocellus and compound eye. Frons and paraocular area dimly shiny, with cancellate PP (25-30 μø). Supraclypeal area (Figs. 21. C; 22. A) weakly convex in lateral view, weakly or dimly shiny, with dense granular PP (25-30 μø); IS with weak reticulation. Clypeal length as long as the distance between lower rim of antennal socket and upper margin of clypeus. Clypeus flat in lateral view, weakly shiny, with moderaely dense granular PP (25-30 μø) and IS with weak reticulation on upper half, with sparse larger shallow PP (45-60 μø) and IS without reticulation on lower half. Basal area of labrum about 1.9 times as wide as long; basal elevation well developed; lateral projection of distal process weakly developed; distal keel of distal process moderately broad, apically obtuse in frontal view; labral fimbria all acutely pointed at apex. Mandible bidentate. Hypostomal carina well developed; its anterior angle obtuse. Postgena nearly smooth. Scape length about 1.0 mm (n= 5), F_1 length about 1.1 times or as long as F_2.

Pronotum with dorsolateral angle obtuse; lateral sulcus distinct. Mesoscutum (Fig. 21. D, E) moderately shiny, rather enamel-like luster, anteriorly and marginally with moderately dense granular PP (20-30 μø), medially and posteriorly with sparse granular PP (25-35 μø); IS anteriorly with weak reticulation, medially and posteriorly without reticulation. Mesoscutellum (Fig. 21. F) medially with weakly depressed, sculpture similar to mesoscutum. Metanotum with weak rugulae. Mesepisternum (Fig. 22. C) coarsely rugulose. Metepisternum with transverse ridges on upper half, with reticulation on lower half. Propodeum: the length of propodeal dorsum shorter than that of mesoscutellum, and about 1.5 times that of metanotum; propodeal dorsum (Fig. 22. D) with irregular sinuate ridges over the surface; transverse carina weak or indisitinct; oblique carinae connected with transverse carina at upper ends; propodeal side rugulose; shield reticulate. Basitibial plate of hind leg marginally carinate. Inner hind tibial spur (Fig. 22. E) with 5-7 small teeth (n= 20).

Metasomal terga weakly shiny or somewhat dimly shiny. T_1 (Fig. 56. F) without striation over the surface, and medially with sparse fine PP ($\leqq$10 μø). T_2 basally and medially with sparse fine PP (10-15 μø), and posteriorly with very weak transverse striation. T_3 with sparse pores over the surface, medially and posteriorly with very weak transverse striation. T_4 with sparse pores and weak transverse striation over the surface.

Male. Body length 8.3–9.7 mm, wing length 6.5–7.6 mm (n= 5).

Color. Similar to female except as follows: lower half of clypeus yellow.

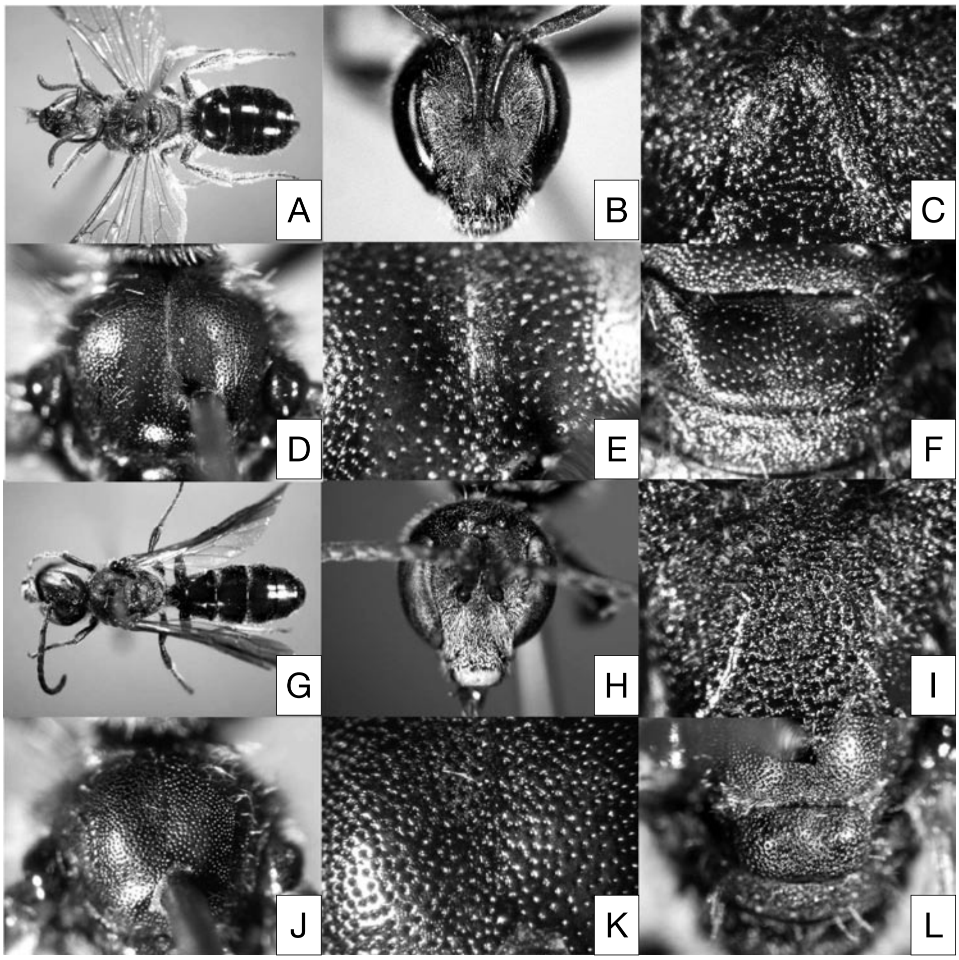

Fig. 21. *Lasioglossum (Evylaeus) nipponense* (Hirashima). A-F: female. G-L: male. A, G: general habitus. B, H: head in frontal view. C, I: supraclypeal area. D, J: mesoscutum. E, K: sculpture of mesoscutum. F, L: mesoscutellum.

Pilosity. Similar to female except as follows: supraclypeal area, lower half of paraocular area, and upper half of clypeus with sparse tomentose; hairs on metanotum finely branched, sparse.

Structure. Similar to female except as follows.

Head length/width ratio 1.13-1.18 (n= 10). Vertex behind ocelli weakly rugulose. Supraclypeal area (Figs. 21. I; 22. F) with cancellate PP (25-30 μø); IS with distinct reticulation. Clypeal length about 1.2 times the distance between lower rim of antennal socket and upper margin of clypeus. The clypeus with cancellate PP (30-40 μø) on upper half. Basal area of labrum about 2.5 times as wide as long; basal elevation and distal process absent. Mandible edentate. Scape length 0.6–0.7 mm (n= 5), F_2 length about 1.7 times F_1.

Mesoscutum (Fig. 21. J, K) with dense granular PP (30-40 μø); IS anteriorly with distinct reticulation, medially and posteriorly without reticulation. The sculptures of metanotum coarser than in female. Basitibial plate of hind leg marginally without carina. Inner hind tibial spur without distinct teeth.

T_1 (Fig. 58. F) medially with moderately dense granular PP (20-25 μø). T_{2-3} basally and medially with moderately dense granular PP (20-25 μø), and posterior margin with weak transverse striation. S_7 with short, apically rounded or pointed median process; S_8 with long, apically rounded or truncate median process (Fig. 23. D).

Male genitalia (Fig. 23. A-C). Gonobasal ventral arm ring-shaped, and not connected with each other at upper ends in ventral view; the bottom nearly flat. The surface of gonocoxite smooth. Gonostylus (Fig. 23. C) with moderately dense pores and short hairs. Ventral retrorse lobe absent.

Variation. Flagellum beneath generally blackish brown in male, but sometimes distinctly yellowish

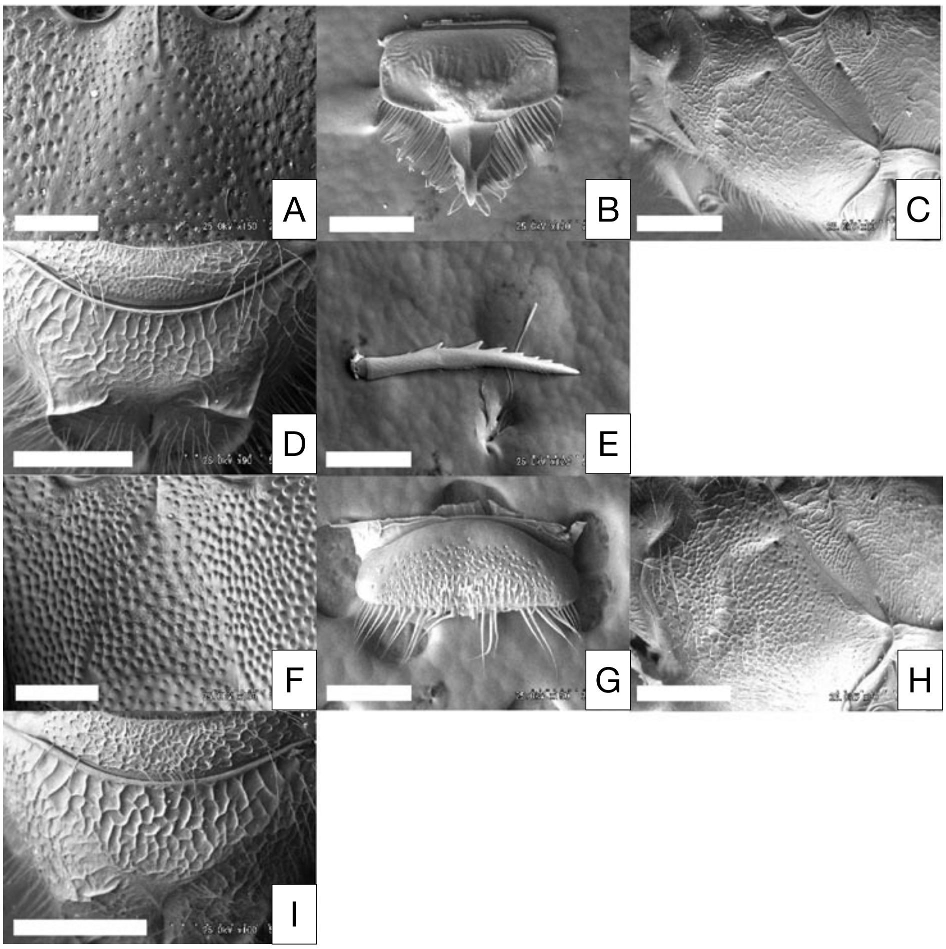

Fig. 22. *Lasioglossum (Evylaeus) nipponense* (Hirashima). A-E: female. F-I: male. A, F: supraclypeal area. B, G: labrum. C, H: mesepisternum. D, I: propodeal dorsum. E: inner hind tibial spur. Scale: C, D, H, I, 0.5mm; B, E, 0.25mm; A, F, G, 0.2mm.

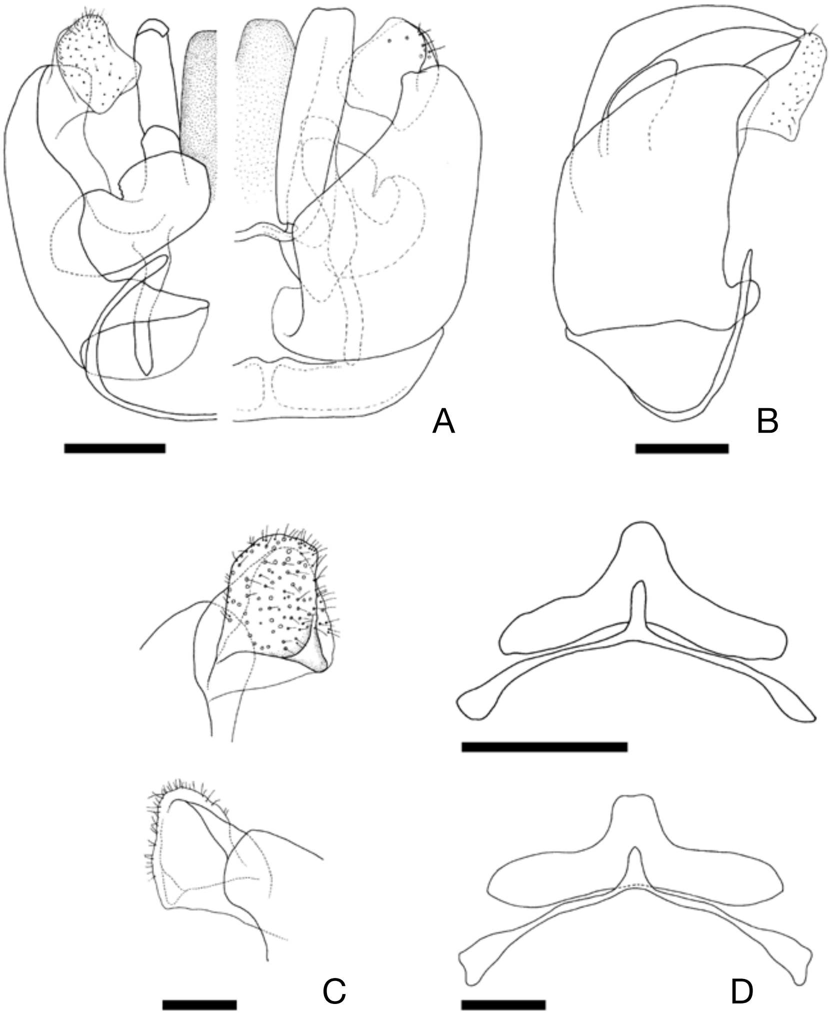

Fig. 23. *Lasioglossum (Evylaeus) nipponense* (Hirashima). A-C: male genitalia. D: S_{7-8}. A: left, ventral view; right, dorsal view. B: lateral view. C: gonostylus (upper, ventral view; lower, dorsal view). Scale: D (upper), 0.5mm; D (lower), 0.25mm; A, B, 0.2mm; C, 0.1mm.

brown.

Remarks. Similar species is not found from Japan. It is characteristic in having the relatively large-sized (about 7-10 mm in both sexes) in the Japanese *Evylaeus* species, the head length distinctly longer than head width in both sexes, the mesoscutum medially with sparse PP in female, and the tibiae and tarsi black or blackish brown in male.

Distribution. Russian Far East (Primorsky, Kurile Islands), Korean Peninsula (south), Japan (Hokkaido, Honshu, Shikoku, Kyushu), **Taiwan= new record**.

Flight records. Female: May to September. Male: June to October.

Biology. Biology of this species is shortly reported as univoltine and solitary bees by Sakagami (1979).

Specimens examined. Holotype: female, Omogokei, Ehime Pref., Japan, 17. vi. 1952 (T. Edashige, ELKU). *Other material*. [**JAPAN**] We have examined 82 females and 43 males from the following localities in Japan: Hokkaido, Aomori, Iwate, Niigata, Tochigi, Gunma, Yamanashi, Fukui, Nagano, Gifu, Tokushima, Ehime, Oita, Kumamoto Prefectures. Some of the specimens examined are listed as follows: [**Hokkaido**] 1 female, Akagawa, Hakodate, 26. viii. 1960 (M. Munakata, SCMH). [**Honshu**] Aomori Pref.: 5 females, Sugayu, Mt. Hakkoda, 30. v. 1975 (O. Tadauchi, ELKU). Iwate Pref.: 1 female, Matsukusa, Kawai-mura, Shimohei-gun, 21. vi. 1986 (H. Takahashi, SCMH). Niigata Pref.: 1 male, Mt. Yone, M-Echigo, 27. x. 1979 (K. Baba, ELKU). Tochigi Pref.: 4 females, Nasu-Yumoto, Nasu-machi, 22. v. 1975 (O. Tadauchi, ELKU). Yamanashi Pref.: 4 females, Masutomi, 9. vi, 17. vi., 8. viii., 28.

viii., 9. ix. 1975 (J. Emoto, ELKU). Fukui Pref.: 1 female, Kinome-touge, 28. v. 1978 (T. Tano, ELKU). [**Shikoku**] Ehime Pref.: 1 female, Wakayama, Omogo-mura, 10. vi. 2004 (T. Sugimoto). [**Kyushu**] Kumamoto Pref.: 3 males, Mt. Neko-dake, 23. viii. 1959 (T. Kawarabata, ELKU).

[**RUSSIAN FAR EAST**] 1 female, SSR., Chabarousk, 7. vii. 1988 (M. Kraus, OLML). [**SOUTH KOREA**] 1 male, Yonsil, Mt. Halla-san, Cheju Is., 24. vii. 1990 (O. Tadauchi, ELKU). [**TAIWAN**] 1 male, Lishan, Taichung, 1. vi. 1971 (K. Kanmiya, ELKU).

latilabrum species-group

Lasioglossum (Evylaeus) latilabrum Murao et Tadauchi, 2006

Lasioglossum (Evylaeus) latilabrum Murao et Tadauchi, 2006, Jpn. J. Syst. Entomol, 12 (2): 203-206 [female, Japan: Amami-ôshima].

Diagnosis. **Female**: body length, 7.5-8.3 mm (n= 4); head width distinctly or slightly longer than head length, head length/width ratio 0.93-0.96 (n= 4); vertex behind ocelli with coarse rugulae; supraclypeal area and clypeus weakly shiny, with moderately dense granular PP (30-50 μø) and IS without reticulation over the surface; genal area with coarse rugulae; Post gena with many ridges; IS of mesoscutum and mesoscutellum without reticulation excluding the anterior part of mesoscutum; mesepisternum with coarse rugulae; the length of propodeal dorsum shorter than that of mesoscutellum, and about 1.4 times that of metanotum; propodeal dorsum with distinct irregular sinuate ridges over the surface; the transverse carina of propodeum distinct; propodeal side and shield with coarse rugulae; inner hind tibial spur pectinate, with 4-6 teeth (n= 4); T_{1-4} with weak or distinct transverse striation over the surface, and without basal hair bands. **Male**: unknown.

Similar species is not found from Japan. In eastern Asia excluding Japan, this species is closely similar to *Lasioglossum (Evylaeus) anthrax* Ebmer from China (Yunnan Province). As to the differences between *L. (E.) latilabrum* and *L. (E.) anthrax*, see Murao & Tadauchi (2006).

Description. See Murao & Tadauchi (2006).

Distribution. Japan (Ryukyus: Amami-ôshima, Okinawa-jima).

Flight records. Female: April to May, and July.

Biology. Unknown.

Specimens examined. See Murao & Tadauchi (2006).

percrassiceps species-group

Lasioglossum (Evylaeus) percrassiceps (Cockerell, 1931)

(Figs. 24. A-O; 25. A-M; 26. A-J; 56. G; 58. G)

Halictus percrassiceps Cockerell, 1931, Amer. Mus. Novit., 466: 14 [female, China: Shanghai]; Hirashima, 1957, Sci. Bull. Fac. Agr., Kyushu Univ., 16 (1): 15.

Lsioglossum (Evylaeus) percrassiceps: Ebmer, 1978b, Bonn. zool. Beitr., 29 (1-3): 211-212 [male, description]; Ebmer, 1980, Linzer biol. Beitr., 12 (2): 502; Ebmer, 1995, Linzer biol. Beitr., 27 (2): 609-610.

Redescription

Female. Body length 8.6–11.0 mm, wing length 7.0-8.0 mm (n= 5).

Color. Body black except as follows: mandible with apical half reddish brown; tegula yellowish brown or brown semitransparent; tibial spur yellow; posterior margins of metasomal terga narrowly yellowish brown semitransparent or entirely black. Wings nearly transparent; veins and pterostigma yellowish brown or brown.

Pilosity. Body pale yellowish brown to whitish. Hairs on head finely branched except as follows: lower paraocular area mixed with moderately dense tomentose; supraclypeal area and clypeus with moderately dense simple hairs; genal area with sparse simple and short hairs. Hairs on mesosoma finely branched except as follows: lateral lobe of pronotum, and metanotum with dense tomentose; lateral slope, propodeal side and shield with dense tomentose; hind trochanter and femur with plumose hairs, forming scopa. T_1 with moderately dense simple and short hairs on disc, and laterally with sparse fine branched hairs. T_{2-4} with dense simple and short hairs over the surface, and with apical fimbriae. T_5 with dense fine branched hairs. Basal hair bands absent.

Structure. Head width distinctly longer than head length; head length/width ratio 0.80-0.84 (n= 7). Vertex medially flat in frontal view, and behind ocelli somewhat granular. Distance between lateral ocelli shorter than the distance between lateral ocellus and compound eye. Frons slightly convex, with dense granular PP (20-30 μø); IS without reticulation. Paraocular area similar to frons in sculpture. Supraclypeal area (Figs. 24. C; 25. A) distinctly convex in lateral view, weakly shiny, with cancellate PP [PP variable in size; dense small PP (10-20 μø) to sparse large PP (25-35 μø)]; IS without

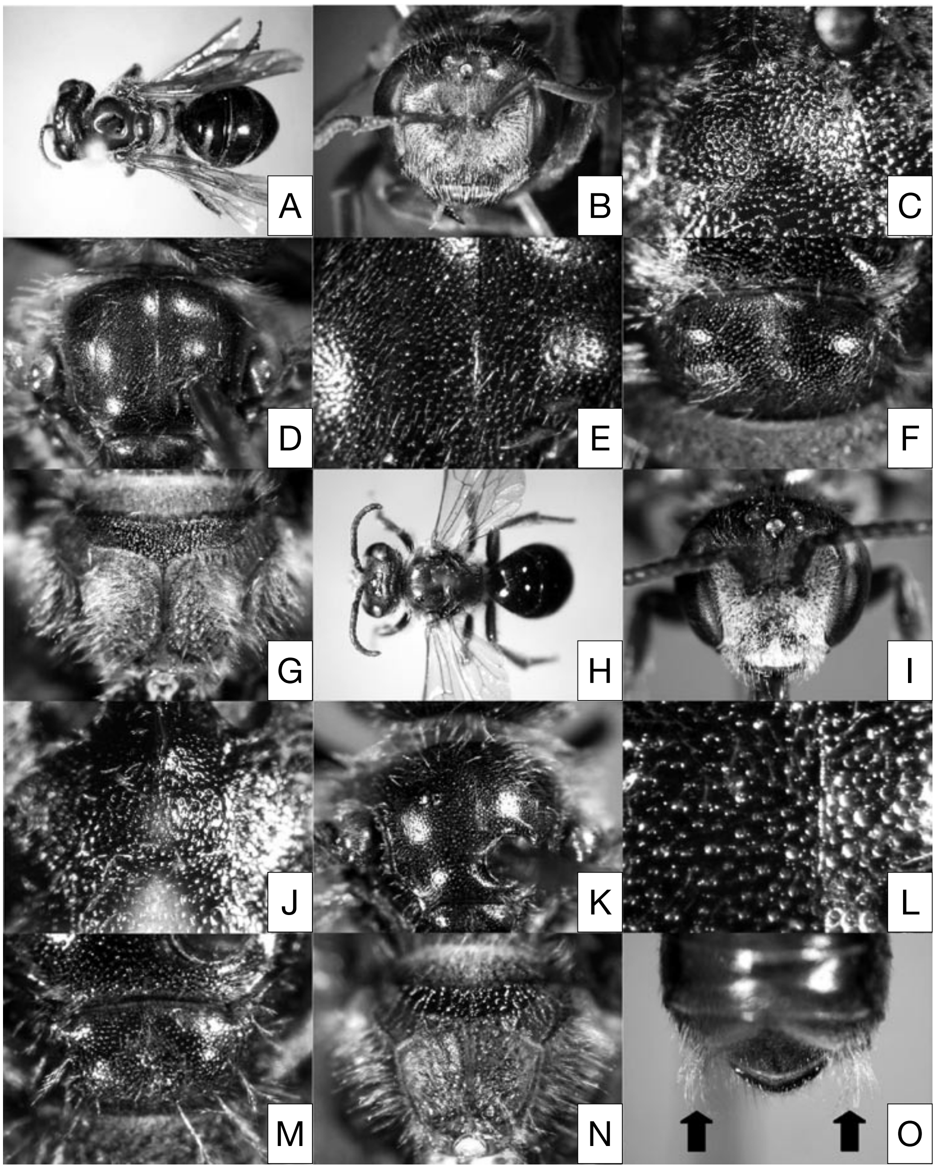

Fig. 24. *Lasioglossum (Evylaeus) percrassiceps* (Cockerell). A-G: female. H-O: male. A, H: general habitus. B, I: head in frontal view. C, J: supraclypeal area. D, K: mesoscutum. E, L: sculpture of mesoscutum. F, M: mesoscutellum. G, N: shield of propodeum. O: distal part of metasomal sterna.

reticulation. Clypeal length about 1.2 times the distance between lower rim of antennal socket and upper margin of clypeus. Clypeus nearly flat, weakly shiny, with cancellate PP [PP variable in size; moderately dense small PP (13-15 μø) to sparse large PP (35-40 μø)] on upper half, and with moderately dense larger shallow PP (40-75 μø) on lower half; IS without reticulation over the surface. Basal area of labrum about 2 times as wide as long; basal elevation well developed; lateral projection of distal process absent; keel of distal process moderately broad, apically bluntly pointed in frontal view; labral fimbria acutely pointed at apex. Mandible bidentate. Hypostomal carina moderately developed; its anterior angle obtuse. Postgena with distinct longitudinal striation. The length of genal area longer than that of compound eye in lateral view. Scape length 1.0-1.2 mm (n= 5), F_1 length about 1.4 times F_2.

Pronotum with dorsolateral angle obtuse. Mesoscutum (Fig. 24. D, E) weakly shiny, with dense granular PP [PP variable in size; dense small PP (10-20 μø) to sparse large PP (25-35 μø)]; IS without reticulation over the surface. Mesoscutellum (Fig. 24. F) medially slightly depressed, with dense granular PP [PP variable in size; dense small PP (10 μø) to sparse large PP (20 μø)]; IS without reticulation over the surface. Metanotum with weak rugulae. Mesepisternum (Fig. 25. D) above with distinct transverse ridges, below with distinct longitudinal ridges on left half. Metepisternum with transverse ridges over the surface. Propodeum: the length of propodeal dorsum distinctly shorter than that of mesoscutellum and metanotum; propodeum dorsomedially with irregular sinuate ridges, and dorsolaterally with longitudinal ridges; transverse carina weak; area between lateral slope and propodeal side distinctly distinguished by developed carina; propodeal side with distinct transverse ridges; shield rugulose. Basitibial plate of hind leg marginally carinate. Inner hind tibial spur (Fig. 25. F) with 3-6 small teeth (n= 7).

Metasomal terga weakly shiny. T_1 (Fig. 56. G) without striation over the surface, and medially and posteriorly with dense pores. $T_{2\text{-}4}$ with dense pores and without striation over the surface.

Male. Body length 6.0-8.0 mm, wing length 6.0-7.0 mm (n=5).

Color. Similar to female except as follows: lower half of clypeus yellow.

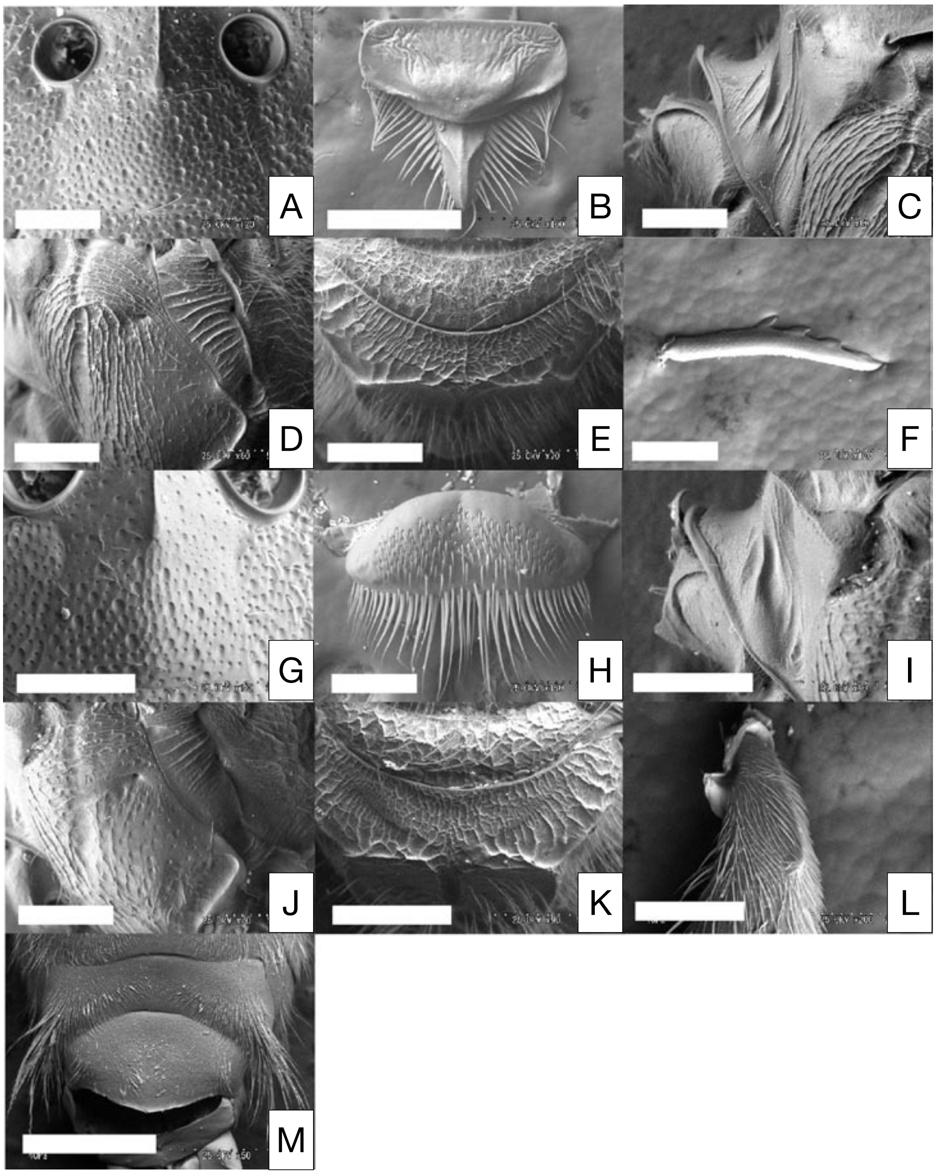

Fig. 25. *Lasioglossum (Evylaeus) percrassiceps* (Cockerell). A-F: female. G-M: male. A, G: supraclypeal area. B, H: labrum. C, I: pronotum in lateral view. D, J: mesepisternum. E, K: propodeal dorsum. F: inner hind tibial spur. L: basitibial plate of hind leg. M: distal part of metasomal sterna. Scale: M, 1mm; B-E, I-K, 0.5mm; A, G, 0.25mm; F, H, L, 0.2mm.

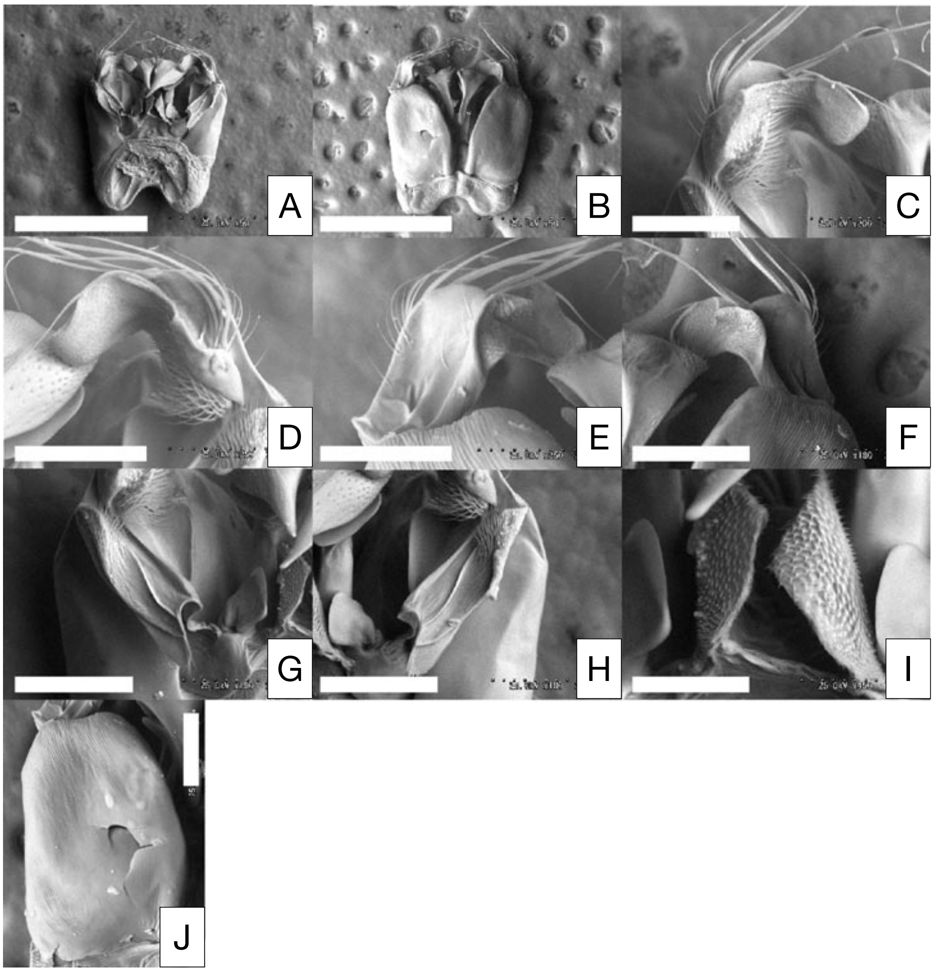

Fig. 26. *Lasioglossum (Evylaeus) percrassiceps* (Cockerell). Male genitalia. A: ventral view. B: dorsal view. C, D: gonostylus in ventral view. E, F: gonostylus in dorsal view. G, H: ventral retrorse lobe. I: a part of penis valve. J: gonocoxite in dorsal view. Scale: A, B, 1mm; F-H, 0.25mm; C-E, J, 0.2mm; I, 0.1mm.

Pilosity. Similar to female except as follows: upper half of clypeus, paraocular and supraclypeal areas with dense tomentose; hind trochanter and femur with sparse fine branched hairs.

Structure. Similar to female except as follows.

Head length/width ratio 0.87-0.95 (n= 7). Clypeal length about 1.5 times the distance between lower rim of antennal socket and upper margin of clypeus. Basal area of labrum about 2.5 times as wide as long, and medially distinctly depressed in frontal view; basal elevation and distal process absent. Mandible edentate. Postgena with weak longitudinal striation. The length of genal area shorter than that of compound eye in lateral view. Scape length 0.6-0.8 mm (n= 5), F_1 length as long as F_2.

Metanotum with coarse rugulae. S_{7-8} not examined.

Male genitalia (Fig. 26. A-J). Gonobasal ventral arm ring-shaped, and connected with each other at upper ends in ventral view; the bottom medially distinctly depressed. Gonostylus, ventral retrorse lobe and penis valve, see Fig. 26. C-I.

Remarks. Similar species is not found from Japan. It is characteristic in having the head width distinctly longer than head length in both sexes, the PP of supraclypeal area and mesoscutum variable in size in both sexes, the F_1 length as long as F_2 in male, the genal area broader than in the other Japanese *Evylaeus* species in female, the propodeum with dense tomentose in both sexes (but male sparser than in female), and T_{2-4} with apical fimbriae in both sexes.

Distribution. China (northeast, Shanghai, Fujian Province), **Korean Peninsula (south), Taiwan= new records**, Japan (Honshu, **Shikoku, Kyushu= new records**).

Flight records. Female: April to October. Male: late

September to early November. Haneda (1990) reported the flight records of males were from July to October in Fukui Pref., Honshu, Japan.

Biology. Unknown.

Specimens examined. [**JAPAN**] [**Honshu**] Niigata Pref.: 1 male, Kurokawa, N-Echigo, 7. xi. 1985 (K. Baba, ELKU). Chiba Pref.: 1 female and 3 males, Iino, Sakura-shi, 31. x., 7. xi. 1973 (H. Suda, ELKU). Ishikawa Pref.: 1 female, Ozo, 26. vii. 1984 (T. Tano, SCMH). Fukui Pref.: 1 female and 1 male, Tenjin-machi, Ôno-shi, 15. vi., 2. x. 1965 (Y. Haneda, SCMH). Osaka Pref.: 1 female, Ikeda-shi, 10. vii. 1935 (Tamasawa, ELKU). Hyogo Pref.: 1 female, Tamba, Sasayama, Okano, 28. v. 1955 (S. Taniguchi, ELKU). [**Shikoku**] Ehime Pref.: 1 female, Ishii-mura, near Matsuyama, 21. iv. 1960 (Y. Hirashima, ELKU). [**Kyushu**] Fukuoka Pref.: 4 females and 1 male, Kashii, Higashi-ku, Fukuoka-shi, 28. ix., 5. x., 8. x. 1959 (Y. Hirashima, ELKU); 3 females and 2 males, Wajiro, Higashi-ku, Fukuoka-shi, 20. ix., 28. ix., 2. x. 1959 (Y. Hirashima, ELKU).

[**CHINA**] 2 females, Fuzhou, Fujian Prov., 24. v. 1961 (SCMH). [**SOUTH KOREA**] 1 female, Suwôn, 29. viii. 1939 (K. Sato, ELKU). [**TAIWAN**] 1 female, Hori, 28. iv. 1929 (K. Sato, ELKU); 1 female, Heitô, Taka-oshû, 1933 (R. Yamaho, ELKU).

vulsum species-group
hoffmanni species-subgroup

Lasioglossum (Evylaeus) hoffmanni (Strand, 1915)

(Figs. 27. A-L; 28. A-I; 29. A-D; 57. A; 59. A)

Halictus hoffmanni Strand, 1915, Entomol. Mitt., 4 (1-3):

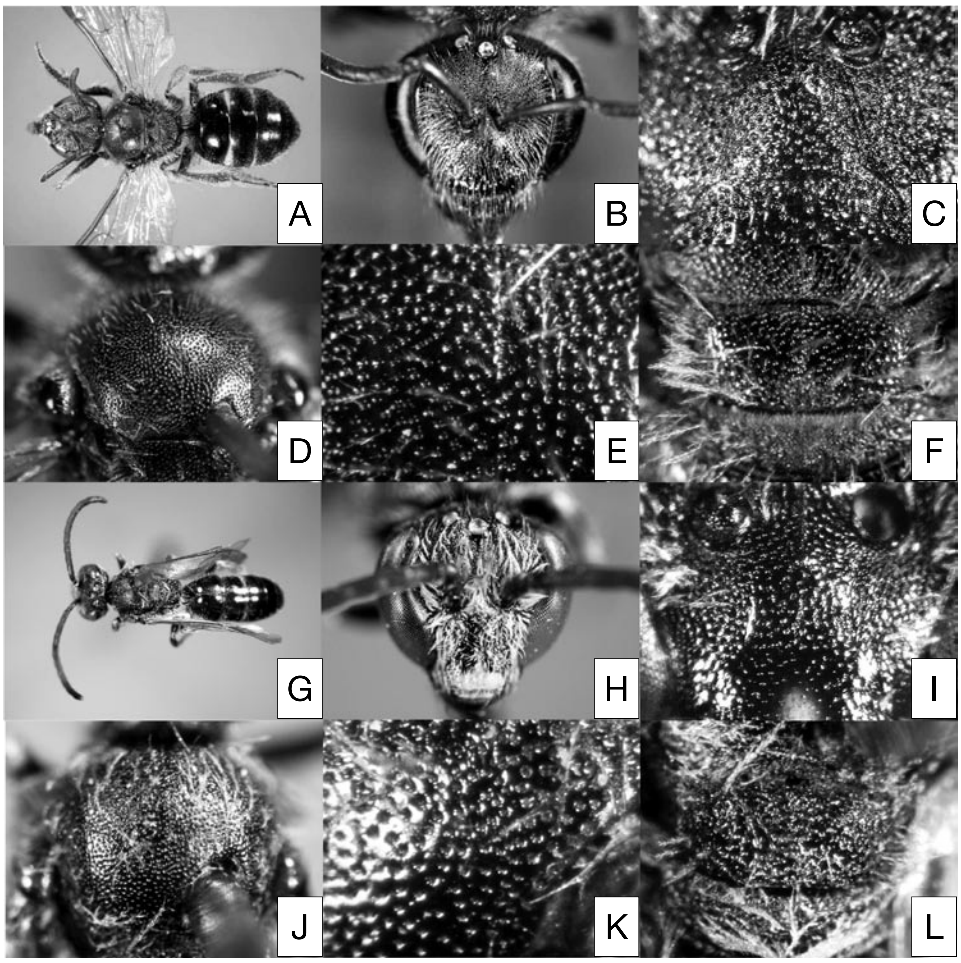

Fig. 27. *Lasioglossum (Evylaeus) hoffmanni* (Strand). A-F: female. G-L: male. A, G: general habitus. B, H: head in frontal view. C, I: supraclypeal area. D, J: mesoscutum. E, K: sculpture of mesoscutum. F, L: mesoscutellum.

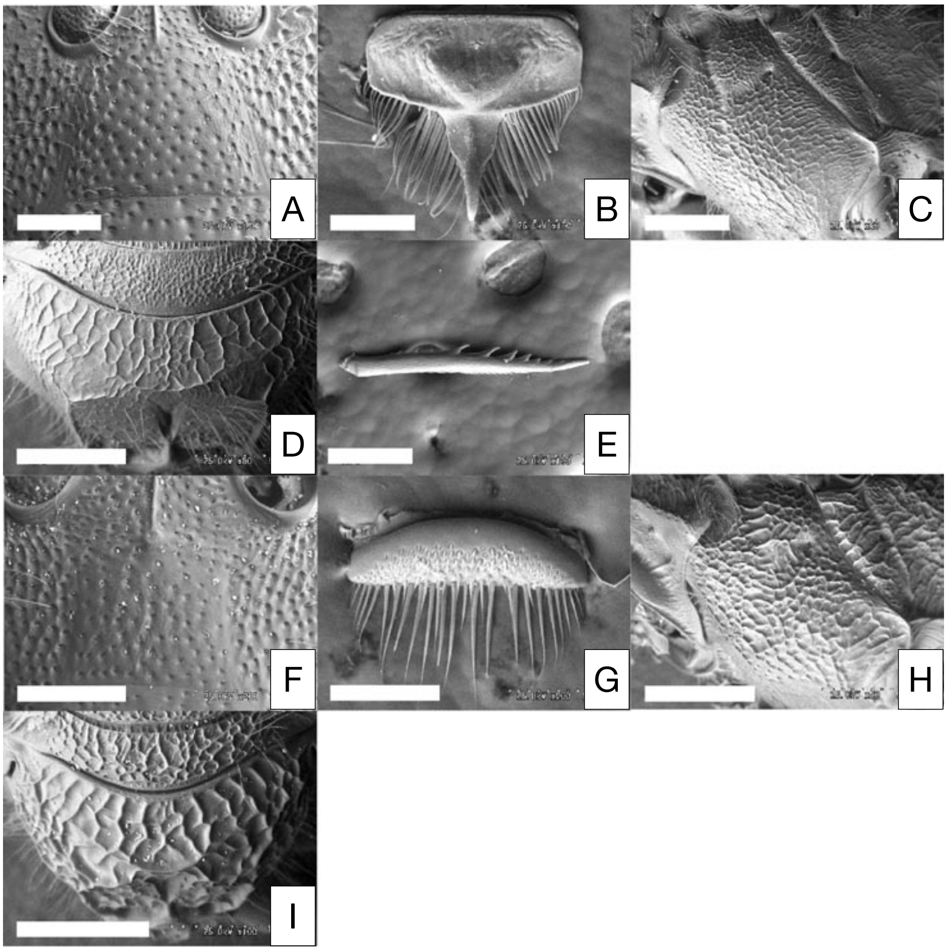

Fig. 28. *Lasioglossum (Evylaeus) hoffmanni* (Strand). A-E: female. F-I: male. A, F: supraclypeal area. B, G: labrum. C, H: mesepisternum. D, I: propodeal dorsum. E: inner hind tibial spur. Scale: C, D, H, I, 0.5mm; A, B, E-G, 0.2mm.

65-66 [female, China: Tsingtau].

Halictus shishkini Cockerell, 1925, Proc. U. S. Nat. Mus., 68 (2607): 6-7 [male, Russia: Siberia].

Lasioglossum (Evylaeus) hoffmanni: Ebmer, 1978b, Bonn. zool. Beitr., 29 (1-3): 202; Ebmer, 1995, Linzer biol. Beitr., 27 (2): 563-564; Ebmer, 1996, Linzer biol. Beitr., 28 (1): 279; Ebmer, 2006, Linzer biol. Beitr., 38 (1): 557.

Redescription

Female. Body length 7.2-8.1mm, wing length 5.6-6.9mm (n=5).

Color. Body black except as follows: apical half of mandible reddish brown; flagellum brown or black; tegula blackish brown semitransparent; legs brown or blackish brown; tibial spur yellow; posterior margins of metasomal terga broadly yellowish brown semitransparent. Wings nearly transparent; veins and pterostigma yellowish brown.

Pilosity. Body pale yellowish brown to whitish. Hairs on head finely branched, moderately dense. Hairs on mesosoma finely branched except as follows: lateral lobe of pronotum and medial area of metanotum with dense tomentose; hind trochanter and femur with plumose hairs, forming scopa. Hairs on anterior and lateral portions of T_1 finely branched, sparse. Hairs on T_{2-4} simple and short on disc, and laterally with a few fine branched haris. Hairs on T_5 mostly finely branched, moderately dense. Basal hair bands present on T_{2-4}.

Structure. Head width distinctly longer than head length; head length/width ratio 0.88-0.94 (n= 10). Vertex behind ocelli weakly rugulose. Distance between lateral ocelli slightly longer than the distance between lateral ocellus and compound eye. Frons dimly shiny and nearly flat, with cancellate PP (20-25 μø). Paraocular area weakly shiny, with cancellate PP (20-25 μø). Supraclypeal area (Figs. 27. C; 28. A) slightly convex in lateral view, weakly shiny, with moderately dense

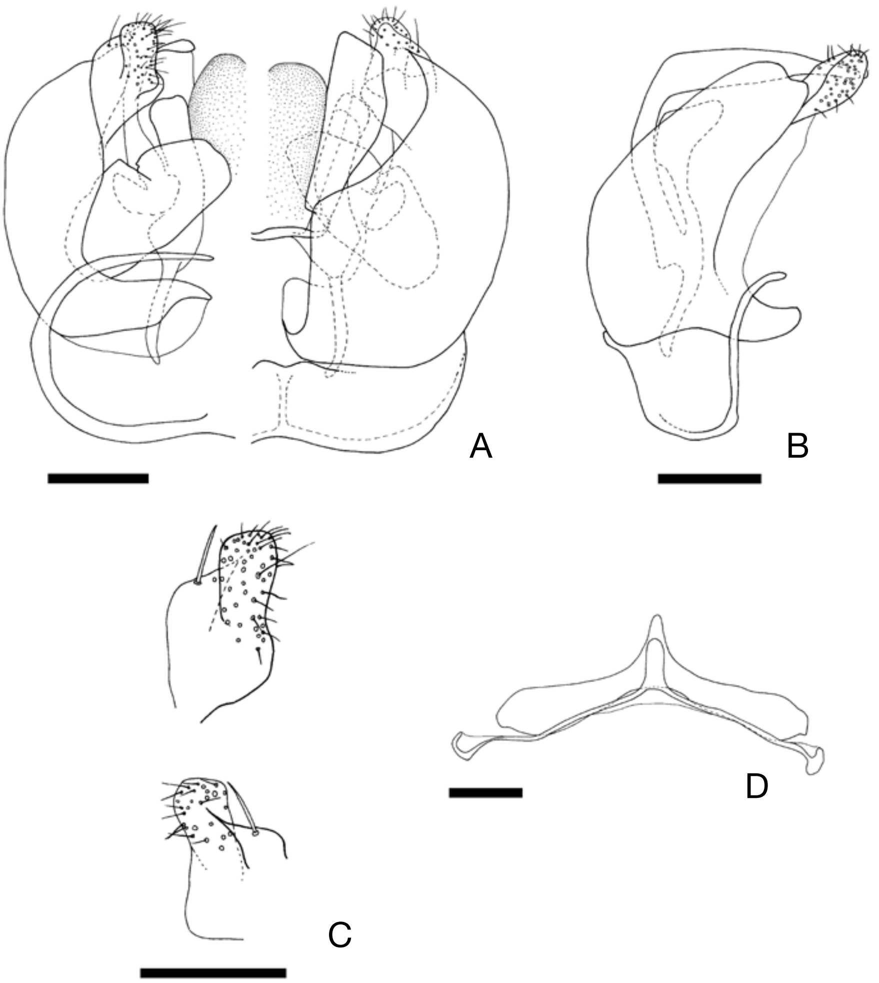

Fig. 29. *Lasioglossum (Evylaeus) hoffmanni* (Strand). A-C: male genitalia. D: $S_{7\text{-}8}$. A: left, ventral view; right, dorsal view. B: lateral view. C: gonostylus (upper, ventral view; lower, dorsal view). Scale: A, B, D, 0.2mm; C, 0.1mm.

granular PP (20-25 μø); IS without reticulation or with very weak reticulation. Clypeal length about 1.4 times the distance between lower rim of antennal socket and upper margin of clypeus. Clypeus nearly flat, weakly shiny, with moderately dense shallow PP (30-45 μø) and IS without reticulation over the surface. Basal area of labrum about 2.2 times as wide as long; basal elevation well developed, narrow apically; lateral projection of distal process absent; keel of distal process moderately broad, apically obtuse in frontal view; labral fimbria acutely pointed at apex. Mandible bidentate. Hypostomal carina moderately developed; its anterior angle obtuse. Postgena with sparse obscure PP and very weak reticulation. Scape length 0.9-1.0 mm (n= 5), F_1 length as long as F_2.

Pronotum with dorsolateral angle obtuse; lateral sulcus distinct. Mesoscutum (Fig. 27. D, E) moderately shiny, with dense granular PP (20-30 μø) over the surface; IS anteriorly with weak reticulation, medially and posteriorly without reticulation. Mesoscutellum (Fig. 27. F) similar to mesoscutum in sculptures. Metanotum rugulose. Mesepisternum (Fig. 28. C) with coarse rugulae. Metepisternum with transverse ridges on upper half, with rugulae on lower half. Propodeum: the length of propodeal dorsum shorter than that of mesoscutellum, and as long as that of metanotum; propodeal dorsum (Fig. 28. D) with irregular sinuate ridges over the surface; transverse carina distinct on dorsoapical area, and indistinct on dorsolateral area; oblique carinae connected with transverse carina at upper ends; propodeal side rugulose; shield rugulose and reticulate. Basitibial plate of hind leg marginally carinate. Inner hind tibial spur (Fig. 28. E) with 2-7 slender teeth (n= 30).

Metasomal terga weakly shiny. T_1 (Fig. 57. A) without striation over the surface, and medially with moderately dense granular PP (15-20 μø). T_2 without striation over the surface, basally and medially with dense granular PP (20 μø). T_{3-4} with moderately dense pores over the surface; T_3 basally and posteriorly with very weak striation; T_4 homogeneous striation with T_3 over the surface.

Male. Body length 5.4-7.2mm, wing length 4.9-6.2mm (n=5).

Color. Similar to female except as follows: labrum, mandible medially, and lower half of clypeus yellow; pronotal lobe yellowish brown; tegula yellowish brown or brown semitransparent; all tibiae basally and apically, and all tarsi yellow.

Pilosity. Similar to female except as follows: face with dense moderately dense tomentose; metanotum, propodeal side, hind trochanter and femur with sparse fine branched hairs; hairs on T_5 simple and short, sparse; basal hair bands absent.

Structure. Similar to female except as follows.

Head width as long as or slightly longer than head length; head length/width ratio 0.97-1.0 (n= 5). Distance between lateral ocelli about 1.4 times distance between lateral ocellus and compound eye. Basal area of labrum about 3.5 times as wide as long; basal elevation and distal process absent. Mandible edentate. Postgena with weak longitudinal striation. Scape length 0.3-0.4 mm (n= 5), F_2 length about 2 times F_1.

Mesoscutellum (Fig. 27. L) convex, but medially depressed, with rugulae. Metanotum and mesepisternum (Fig. 28. H) with coarse rugulae. The sculptures of propodeum coarser than in female. Basitibial plate of hind leg marginally without carina. Inner hind tibial spur without distinct teeth.

T_{2-3} basally and medially with moderately dense granular PP (15-20 μø), and posteriorly with very weak transverse striation. T_4 with sparse pores and very weak transverse striation over the surface. S_{7-8} (Fig. 29. D) with moderately long, apically round median process.

Male genitalia (Fig. 29. A-C). Gonobasal ventral arm ring-shaped, and not connected with each other at upper ends in ventral view; the bottom slightly depressed in dorsal and ventral views. The surface of gonocoxite smooth. Gonostylus (Fig. 29. C) somewhat tetragon in ventral view, with moderately dense pores and sparse short hairs.

Remarks. In Japan, this species is closely similar to *Lasioglossum (Evylaeus) naitoi* Ebmer et Maeta, but can be separated from it by the mesoscutum medially with dense PP in female, the mesoscutellum with coarse rugulae in male, and the T_1 medially with moderately dense PP in female. Also, this species is relatively similar to *L. (E.) sibiriacum* (Blüthgen), but can be separated from it by the luster of mesoscutum stronger than in *L. sibiriacum* in both sexes, the mesoscutum with granular PP over the surface in both sexes, the IS of mesoscutum medially without reticulation in both sexes, the PP on T_1 sparser than in *L. (E.) sibiriacum* in both sexes, and the male genitalia without ventral retrorse lobe.

In Palaearctic Region excluding Japan, this species is closely similar to *L. (E.) laticeps* (Schenck) from Europe, but can be separated from it by the T_2 without the transverse striation in female, and the mesoscutellum with weak rugulae in male.

Distribution. Russian Far East (Siberia, Primorsky), China (northeast), Korean Peninsula (north, **south= new record**), Japan (Hokkaido, Honshu, Shikoku, Kyushu, Tsushima).

Flight records. Female: March to early October. Male: July to September.

Biology. The social structure of this species [recorded as *L. (E.) vulsum* (Vachal)] was shortly reported an eusocial bee by Sakagami (1979).

Comments. This species has been misidentified as *L. (E.) vulsum* (Vachal) in Japan.

Specimens examined. **Lectotype**: female, Tsingtau, CHINA (Prof. Hoffmann, DEI). **Paralectotype**: 2 females, Tsingtau, CHINA, iv. (Prof. Hoffmann, DEI); 1 female, Tsingtau, Lazarettgarten, CHINA, 22. vi. (Prof. Hoffmann, DEI). *Other material*. [**JAPAN**] We have examined 336 females and 11 males from the following localities in Japan: Hokkaido, Aomori, Iwate, Gunma, Ibaraki, Kanagawa, Nagano, Niigata, Fukui, Gifu, Nara, Mie, Wakayama, Okayama, Tottori, Shimane, Hiroshima, Yamaguchi, Tokushima, Ehime, Fukuoka, Saga, Nagasaki, Oita, Kumamoto, Miyazaki, Kagoshima Prefectures. Some of the specimens examined are listed as follows. [**Hokkaido**] 2 females and 3 males, Botanical Garden, Sapporo, 29. vi., 8. vii., 25. viii. 1959 (S. F. Sakagami, SCMH). [**Honshu**] Aomori Pref.: 1 male, Tamarigawa, Yokohama, 27. viii. 2003 (Y. Machita, GC). Iwate Pref.: 1 male, Yanagawa, Morioka, 3. viii. 2001 (S. Numasawa, GC). Ibaraki Pref.: 1 female, Kouyadai, Tsukuba, 7. vi. 1989 (T. Matsumura, SCMH). Niigata Pref.: 1 female, Sasagawa, Nishimikawa, Sadoga-shima, 12. v. 1985 (K. Baba, ELKU). Nagano Pref.: 2 females, Ôyanohara, Mt. Shirouma, 15. v. 1975 (O. Tadauchi, ELKU). Fukui Pref.: 1 male, Suwara, Ôno-shi, 9. ix. 1973 (Y. Haneda, SCMH). Mie Pref.: 2 females, Kabuto, Seki-machi, 13. v. 1975 (O. Tadauchi, ELKU). Shimane Pref.: 1 female, Yokoyama-cho, Hamada-shi, 3. vii. 2004 (R. Murao). [**Shikoku**] Tokushima Pref.: 2

females, Sho-machi, 23. iv. 1960 (T. Kobayashi, ELKU). [**Kyushu**] Fukuoka Pref.: 3 males, Okino-shima, 25-28. vii. 1958 (Y. Hirashima, Y. Murakami & Y. Miyatake, ELKU); 1 female, Kyushu Univ., Hakozaki, Higashi-ku, Fukuoka-shi, 7. iv. 2007 (R. Murao). Nagasaki Pref.: 1 female, Tsutsu, Tsushima, 7. x. 1959 (Y. Hirashima, ELKU). Kumamoto Pref.: 5 females, Nishihara-mura, Aso-gun, 29. v. 2000 (R. Murao, ALKK).

[**CHINA**] 1 female, Ganguyi, 110, 3'-36, 8', 35km NE of Yanan, 17-18. v. 1996 (J. Halada, OLML); 1 female, Monan, 111, 7'-34, 7', river Huang, 26-28. v. 1996 (J. Halada, OLML); 1 female, Suide, 110, 7'-37, 3', 13-14. v. 1996 (J. Halada, OLML). [**RUSSIAN FAR EAST**] 1 male, Kongaus, Siberia, viii. 1923 (T. D. A. Cockerell, USNM); 1 female, Samarka, Primorsky, 30. v. 1993 (V. Sidorenko, MC). [**SOUTH KOREA**] 31 females, Ora-dong, Cheju city, Cheju Is., 4. iv. 1998 (O. Tadauchi, ELKU); 9 females, Yeongpyeong-dong, Cheju city, Cheju Is., 4. iv. 1998 (O. Tadauchi, ELKU).

Lasioglossum (Evylaeus) naitoi Ebmer et Maeta, 1994

(Figs. 30. A-L; 31. A-I; 32. A-D; 57. B; 59. B)

Lasioglossum (Evylaeus) naitoi Ebmer et Maeta, *in* Ebmer et al., 1994, Bull. Fac. Agr. Shimane Univ. 28: 27 [female, Japan: Iriomote-jima]; Ebmer, 1995, Linzer biol. Beitr., 27 (2): 557; Ikudome, 1999, Ident. Guide Aculeata Nansei Is., Jap.: 584.

Redescription (male: new to science)

Female. Body length 7.0-7.8 mm, wing length 5.8-6.2 mm (n=5).

Color. Body black except as follows: mandible with apical half reddish brown; flagellum beneath blackish brown; tegula narrowly yellowish anteriorly, broadly

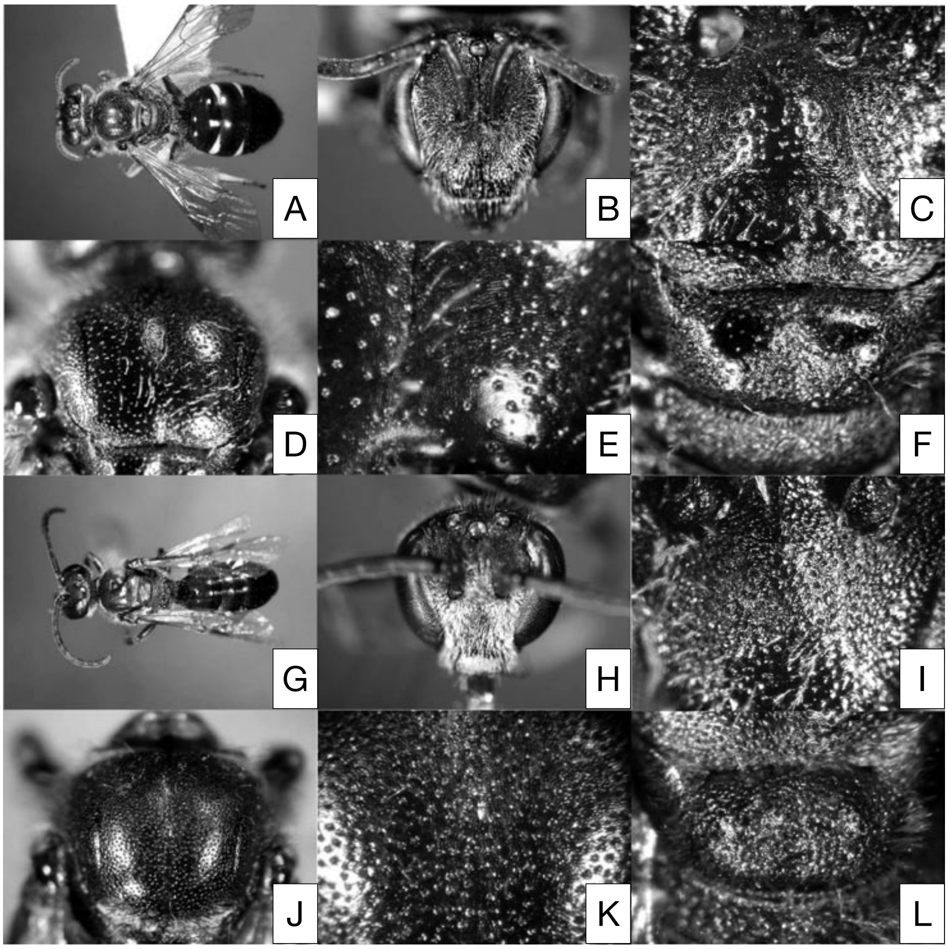

Fig. 30. *Lasioglossum (Evylaeus) naitoi* Ebmer et Maeta. A-F: female. G-L: male. A, G: general habitus. B, H: head in frontal view. C, I: supraclypeal area. D, J: mesoscutum. E, K: sculpture of mesoscutum. F, L: mesoscutellum.

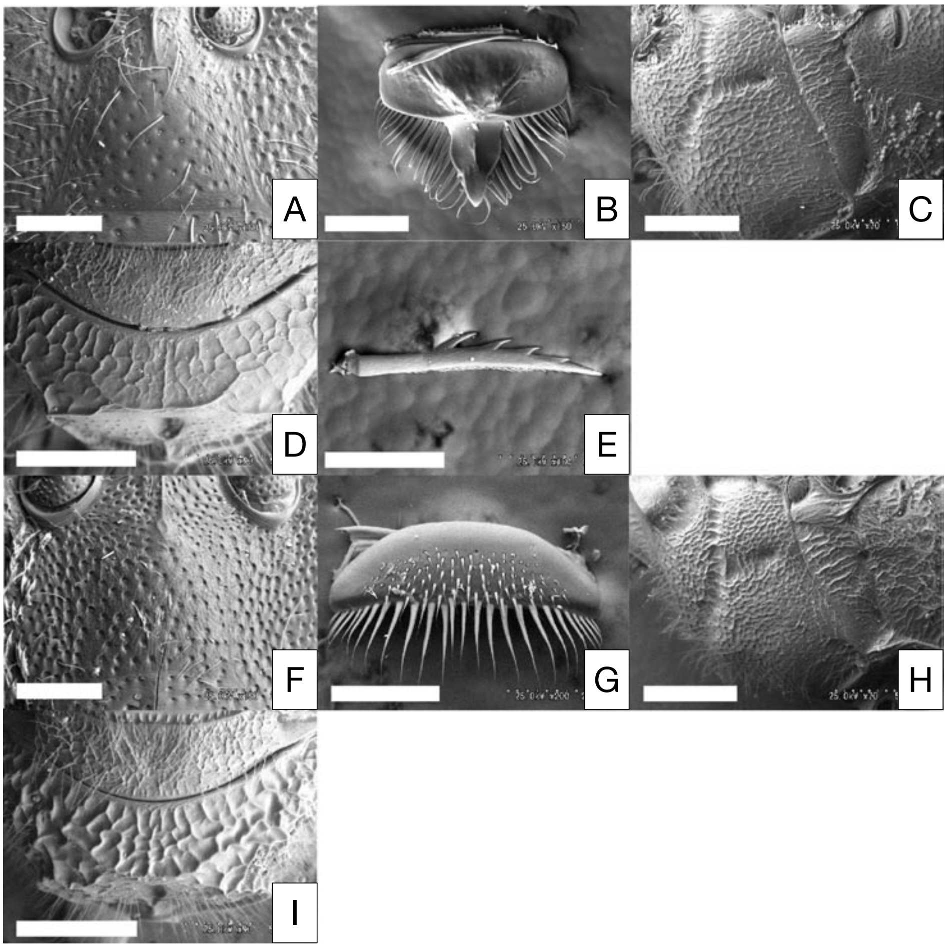

Fig. 31. *Lasioglossum (Evylaeus) naitoi* Ebmer et Maeta. A-E: female. F-I: male. A, F: supraclypeal area. B, G: labrum. C, H: mesepisternum. D, I: propodeal dorsum. E: inner hind tibial spur. Scale: C, D, H, I, 0.5mm; A, B, E-G, 0.2mm.

brownish semitransparent posteriorly; posterior margins of metasomal terga narrowly yellowish brown semitransparent. Wings nearly transparent; veins and pterostigma blackish brown; tibial spur yellow.

Pilosity. Body pale yellowish brown to whitish. Hairs on head finely branched, moderately dense. Hairs on mesosoma finely branched except as follows: lateral lobe of pronotum and anterior area of metanotum with dense tomentose; hind trochanter and femur with plumose hairs, forming scopa. Hairs on anterior and lateral portions of T_1 finely branched, sparse. T_{2-4} with simple and short hairs on disc, and laterally with a few fine branched hairs. Hairs on T_5 mostly finely branched, moderately dense. Basal hair bands present on T_{2-4}.

Structure. Head width distinctly longer than head length; head length/width ratio 0.89-0.94 (n= 10). Vertex behind ocelli with weak rugulae. Distance between lateral ocelli as long as the distance between lateral ocellus and compound eye. Frons and paraocular area dimly shiny, with cancellate PP (20-30 μø). Supraclypeal area (Figs. 30. C; 31. A) slightly convex in lateral view, somewhat dimly shiny, with moderately dense granular PP (20-30 μø); IS with weak reticulation. Clypeal length slightly longer than the distance between lower rim of antennal socket and upper margin of clypeus. Clypeus nearly flat, weakly shiny, with moderately dense larger shallow PP (30-45 μø) over the surface; IS with weak reticulation on upper half, and without reticulation on lower half. Basal area of labrum about 2 times as wide as long; basal elevation well developed, narrow apically; lateral projection of distal process absent; keel of distal process moderately broad, apically obtuse in frontal view; labral fimbria acutely pointed at apex. Mandible bidentate. Hypostomal carina moderately developed; its anterior angle obtuse. Postgena with distinct longitudinal striation. Scape length about 0.9 mm (n= 5), F_1 length as long as F_2.

Pronotum with dorsolateral angle obtuse; lateral sulcus distinct. Mesoscutum (Fig. 30. D, E) weakly shiny, anteriorly and laterally with dense granular PP (20-25 μø), medially and posteriorly with sparse granular PP (20-35 μø); IS anteriorly with distinct reticulation, medially and posteriorly with weak reticulation. Mesoscutellum (Fig. 30. F) weakly convex, with weak longitudinal depression, marginally and longitudinally with homogeneous PP and IS as in mesoscutum. Metanotum with weak rugulae. Mesepisternum (Fig. 31. C) with coarse rugulae. Metepisternum with transverse ridges on upper half, with rugulae on lower half. Propodeum: the length of propodeal dorsum shorter than that of mesoscutellum, and as long as that of metanotum; propodeal dorsum (Fig. 31. D) with irregular sinuate ridges over the surface; transverse carina distinct on dorsoapical area, and indistinct on dorsolateral area; oblique carinae connected with transverse carina at upper ends; propodeal side rugulose; shield reticulate. Basitibial plate of hind leg marginally carinate. Inner hind tibial spur (Fig. 31. E) with 3-6 slender teeth (n= 19).

Metasomal terga weakly shiny. T_1 (Fig. 57. B) without striation over the surface, and medially with sparse fine PP (≦10 μø). T_2 basally and medially with moderately dense pores, basally and posteriorly with very weak transverse striation. $T_{3\text{-}4}$ with moderately dense pores and weak transverse striation over the surface.

Male. Body length 5.7-7.0mm, wing length 4.6-5.9mm (n=2).

Color. Similar to female except as follows: labrum, mandible medially, lower half of clypeus, and pronotal lobe yellow; all tibiae basally and apically, and all tarsi yellow.

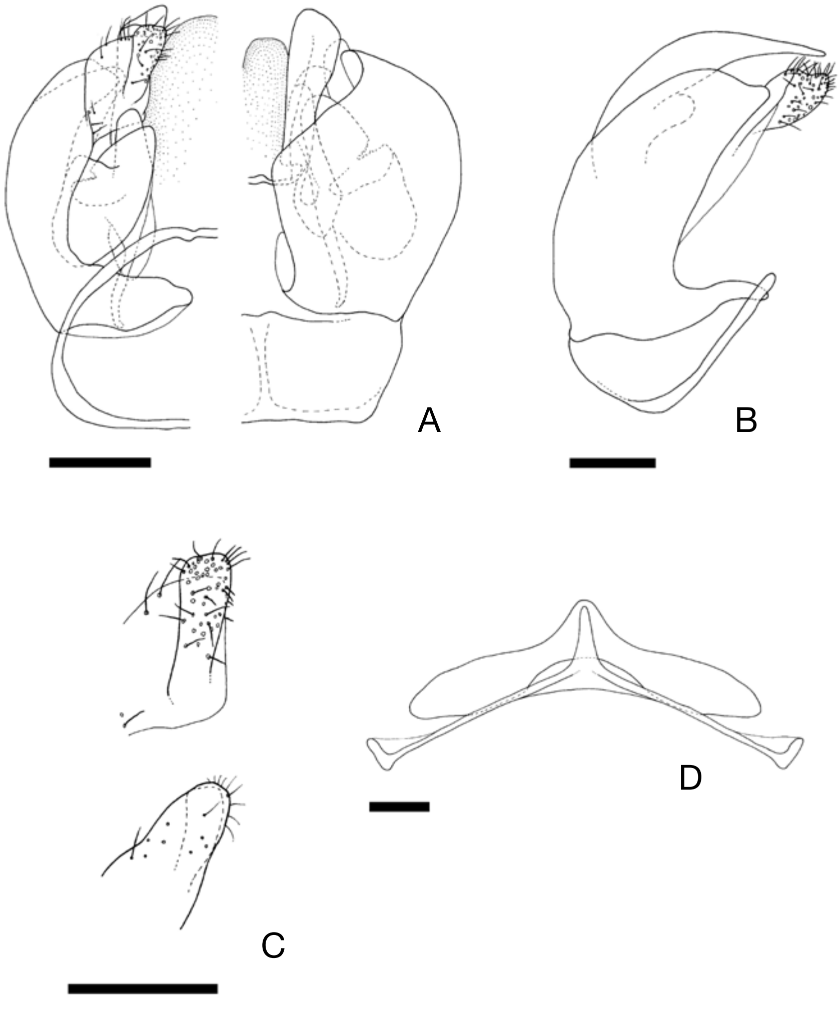

Fig. 32. *Lasioglossum (Evylaeus) naitoi* Ebmer et Maeta. A-C: male genitalia. D: $S_{7\text{-}8}$. A: left, ventral view; right, dorsal view. B: lateral view. C: gonostylus (upper, ventral view; lower, dorsal view). Scale: A-D, 0.2mm.

Pilosity. Similar to female except as follows: hairs on lower paraocular area, supraclypeal area, and upper 1/3 of clypeus with moderately dense tomentose; metanotum, propodeal side, hind trochanter and femur with sparse fine branched hairs; T_{1-5} with moderately dense simple and short hairs on disc; basal hair bands absent.

Structure. Similar to female except as follows.

Head length as long as head width; head length/ width ratio 0.99-1.0 (n= 3). Distance between lateral ocelli about 1.6 times the distance between lateral ocellus and compound eye. Supraclypeal area (Figs. 30. I; 31. F) with dense granular PP (20-25 μø) and IS distinct reticulation. Clypeal length about 1.5 times the distance between lower rim of antennal socket and upper margin of clypeus. Basal area of labrum about 3.2 times as wide as long; basal elevation and distal process absent. Mandible edentate. Scape length 0.4-0.5 mm (n= 3), F_2 length about 2 times F_1.

Mesoscutum (Fig. 30. J, K) weakly shiny; its surface anteriorly with dense granular PP (20-25 μø), medially and posteriorly with moderately dense granular PP (20-30 μø); IS anteriorly with distinct reticulation, medially and posteriorly without reticulation. Mesoscutellum (Fig. 30. L) with moderately dense granular PP (25-30 μø) over the surface, or marginally and longitudinally with cancellate PP (25-30 μø); IS with weak reticulation. The sculptures of metanotum and propodeum coarser than in female. Basitibial plate of hind leg mariginally without carina. Inner hind tibial spur without distinct teeth.

T_1 (Fig. 59. B) medially with moderately dense fine PP (≦10 μø), and posteriorly with weak transverse striation. T_{2-3} basally and medially with dense pores, and posteriorly with weak transverse striation. T_4 with moderately dense pores and weak transverse striation over the surface. S_7 with narrow and moderately long, median process; S_8 with moderately long, apically rounded median process (Fig. 32. D).

Male genitalia (Fig. 32. A-C). Gonobasal ventral arm ring-shaped, and connected with each other at upper ends in ventral view; the bottom nearly flat in dorsal and ventral views. The surface of gonocoxite smooth. Gonostylus (Fig. 32. C) somewhat tetragon in ventral view, with moderately dense pores and sparse short hairs.

Remarks. This species is closely similar to *Lasioglossum (Evylaeus) hoffmanni* (Strand), but can be separated from it by the mesoscutum medially with sparse PP in female, and the sculpture of mesoscutellum not coarser than in *L. (E.) hoffmanni* in male, the T_1 medially with sparse PP in female.

Distribution. Japan (Ryukyus: Amami-ôshima, Okinawa-jima, Aka-jima, Iriomote-jima).

Flight records. Female: March to May. Male: May.

Biology. Unknown.

Specimens examined. Holotype, Iriomote-jima, Okinawa Pref., Japan, 15. iii. 1994 (T. Naito, MCDS). *Other material*. [**JAPAN**] [**Ryukyus**] Amami-ôshima, Kagoshima Pref.: 2 females, Yuwan, 8. v. 1953 (T. Shiraki, ELKU); 1 female, Koniya, 2. iv. 1954 (R. Ishikawa, ELKU); 1 male, Sinokawa-Koniya, 21. v. 1954 (S. Taniguchi, ELKU); 1 female, Mt. Yuwan-dake, 25. iii. 2003 (R. Murao); 14 females, Nishinakama, 25. v. 1973, 24. v. 1978, 25. v. 1978, 26. v. 1978 (H. Makihara, ELKU); 7 females, Shinmura, 12. v., 22. v. 1954 (S. Taniguchi, ELKU); 1 female, Yamato-son, Ôshima-gun, 5. iv. 2005 (K. Mitai). Okinawa-jima, Okinawa Pref.: 1 male, Mt. Nago-dake, 20. v. 2004 (T. Mita); 1 male, Hentona, Kunigami-son, 17. v. 1999 (Y. Maeta, MCDS); 2 females, Hento, 5. iv. 1979 (K. Ôhara, ELKU); 6 females, Hiji, Kunigami-son, 1. iv. 2005 (K. Mitai); 4 females, Sakimotobu, Motobu-cho, Kunigami-son, 2. iv. 2005 (K. Mitai); 3 females, Taira, Higashi-son, 19. iv. 1999 (M. Asano, MCDS). Aka-jima, Okinawa Pref.: 2 females, 5. v. 1986 (M. Minami, SCMH).

Lasioglossum (Evylaeus) solisortus Ebmer et Maeta, 1994

(Figs. 33. A-O; 34. A-K; 35. A-D; 57. C; 59. C)

Lasioglossum (Evylaeus) solisortus Ebmer et Maeta, *in* Ebmer et al., 1994, Bull. Fac. Agr. Shimane Univ., 28: 24-26 [female & male, Japan: Iriomote-jima]; Ebmer, 1995, Linzer biol. Beitr., 27 (2): 556-557; Ikudome, 1999, Ident. Guide Aculeata Nansei Is., Jap.: 585.

Redescription

Female. Body length 6.7–7.8 mm, wing length 6.0–7.0 mm (n= 5).

Color. Body black except as follows: mandible with apical half reddish brown; tegula brownish semitransparent; tibial spur yellow; posterior margins of metasomal terga narrowly reddish brown semitransparent. Wings slightly infuscate; veins and pterostigma brown.

Pilosity. Body pale yellowish brown to dull whitish. Hairs on head finely branched, moderately dense. Hairs on mesosoma finely branched except as follows: lateral lobe of pronotum with dense tomentose; hind trochanter and femur with plumose hairs, forming scopa. Hairs on anterior and lateral portions of T_1 finely branched, sparse. T_{2-4} with moderately dense simple and short hairs on disc, and laterally with sparse fine branched

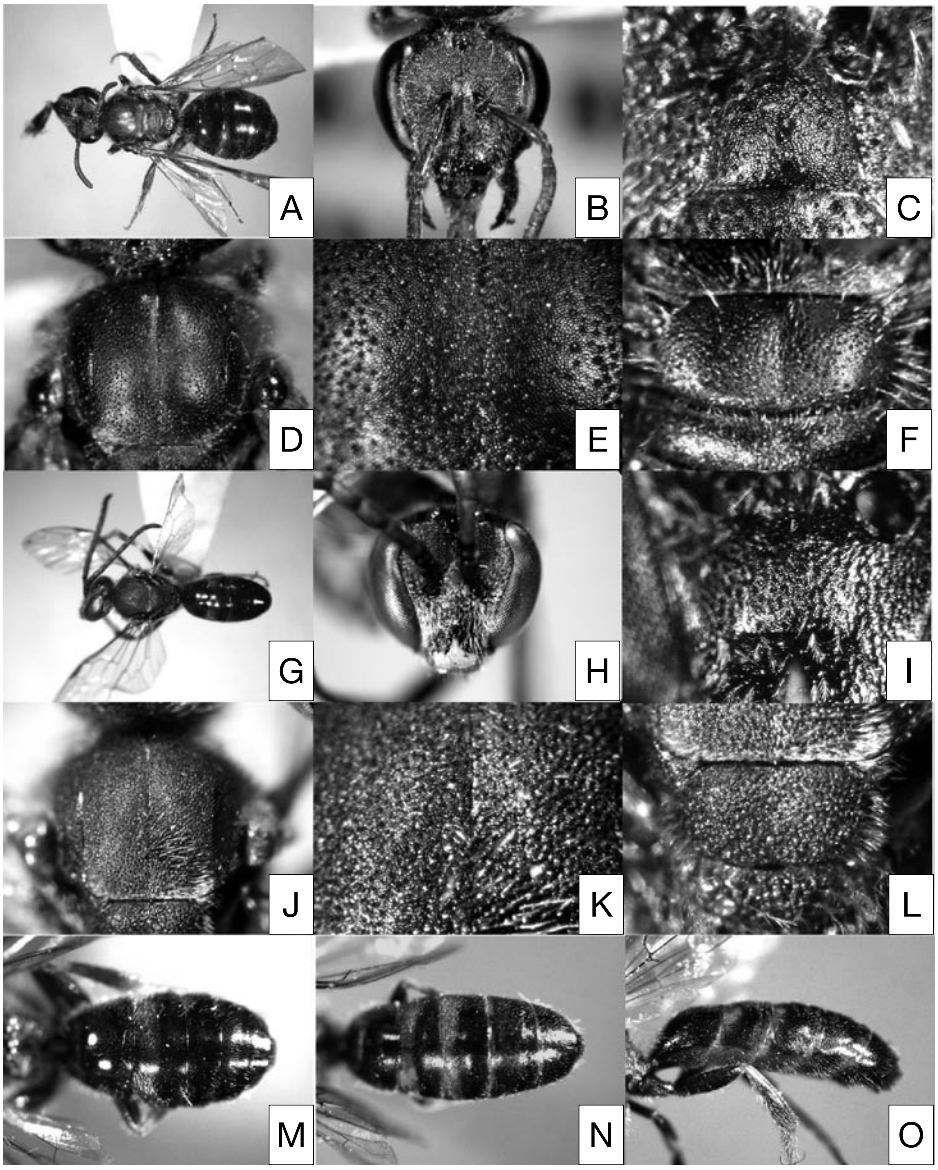

Fig. 33. *Lasioglossum (Evylaeus) solisortus* Ebmer et Maeta. A-F: female. G-O: male. A, G: general habitus. B, H: head in frontal view. C, I: supraclypeal area. D, J: mesoscutum. E, K: sculpture of mesoscutum. F, L: mesoscutellum. M-O: color variation of metasomal terga (M, N: dorsal view. O: lateral view).

hairs. T_5 with dense fine branched hairs over the surface. Basal hair bands slightly present on $T_{2\text{-}3}$, but sometimes absent.

Structure. Head width distinctly longer than head length; head length/width ratio 0.80-0.89 (n= 10). Vertex medially flat in frontal view, and behind ocelli with weak rugulae. Distance between lateral ocelli about 1.3 times the distance between lateral ocellus and compound eye. Frons and paraocular area dimly shiny, with cancellate PP (20-35 μø). Supraclypeal area (Figs. 33. C; 34. A) slightly convex in lateral view, dimly shiny, with moderately dense granular PP (20-30 μø); IS with distinct reticulation. Clypeal length slightly longer than the distance between lower rim of antennal socket and upper margin of clypeus. Clypeus nearly flat, dimly shiny on upper 1/3, and weakly shiny on lower 2/3; with moderately dense granular and shallow PP (20-50 μø) over the surface; IS with distinct reticulation on upper half, and without reticulation on lower half. Basal area of labrum about 2.6 times as wide as long; basal elevation well developed; lateral projection of distal process absent; keel of distal process broad, apically bluntly pointed in frontal view; labral fimbria acutely pointed at apex. Mandible bidentate. Hypostomal carina moderately developed; its anterior angle obtuse. Postgena with distinct longitudinal striation. Scape length 0.9-1.0 mm (n= 5), F_1 length as long as F_2.

Pronotum with dorsolateral angle obtuse; lateral sulcus distinct. Mesoscutum (Fig. 33. D, E) dimly shiny, with dense granular PP (20-30 μø) and IS with distinct reticulation over the surface. Mesoscutellum (Fig. 33. F) similar to mesoscutum in sculpture. Metanotum with distinct reticulation. Mesepisternum (Fig. 34. C) with coarse rugulae. Metepisternum with transverse ridges on upper half, with rugulae on lower half. Propodeum: the length of propodeal dorsum shorter than that of mesoscutellum, and as long as that of metanotum; propodeal dorsum (Fig. 34. D) with irregular sinuate ridges over the surface; transverse carina weak, and in many specimens indistinct; propodeal side rugulose; shield reticulate. Basitibial plate of hind leg marginally carinate. Inner hind tibial spur (Fig. 34. G) with 5-6 slender teeth (n= 20).

Metasomal terga weakly shiny. T_1 (Fig. 57. C) without striation over the surface, medially and posteriorly with moderately dense fine PP (≦10 μø). T_2 basally and medially with dense fine PP (10 μø), basally and posteriorly with weak transverse striation. T_{3-4} with moderately dense pores and weak reticulation over the surface.

Male. Body length 6.4-8.6 mm, wing length 5.6-7.0 mm (n=5).

Color. Similar to female except as follows: mandible basally and medially, lower half of clypeus yellow; pronotal lobe yellowish brown; all tibiae basally and apically yellow; all tarsi yellow or yellowish brown.

Pilosity. Similar to female except as follows: paraocular and supraclypeal areas with moderately dense tomentose; hind trochanter and femur with short, simple and finely branched hairs; T_{1-4} with moderately dense simple and short hairs over the surface; basal hair bands

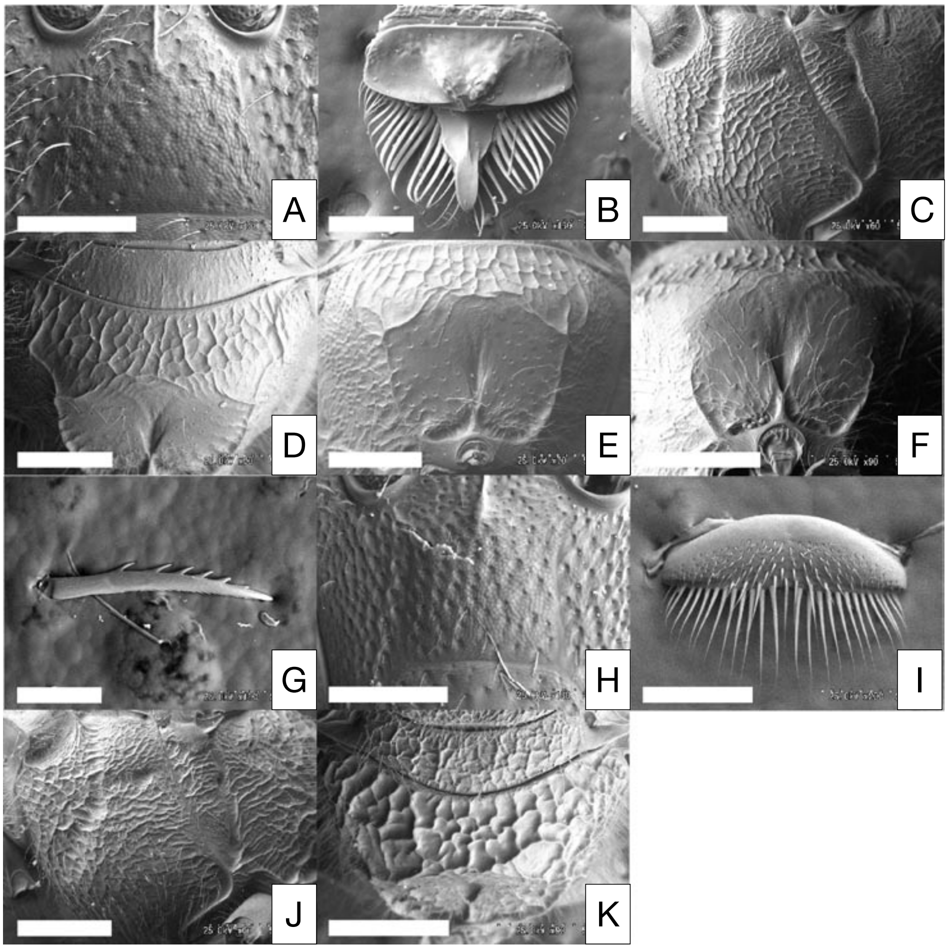

Fig. 34. *Lasioglossum (Evylaeus) solisortus* Ebmer et Maeta. A-G: female. H-K: male. A, H: supraclypeal area. B, I: labrum. C, J: mesepisternum. D, K: propodeal dorsum. E, F: shield of propodeum. G: inner hind tibial spur. Scale: C-E, J, K, 0.5mm; A, H, 0.25mm; B, G, I, 0.2mm.

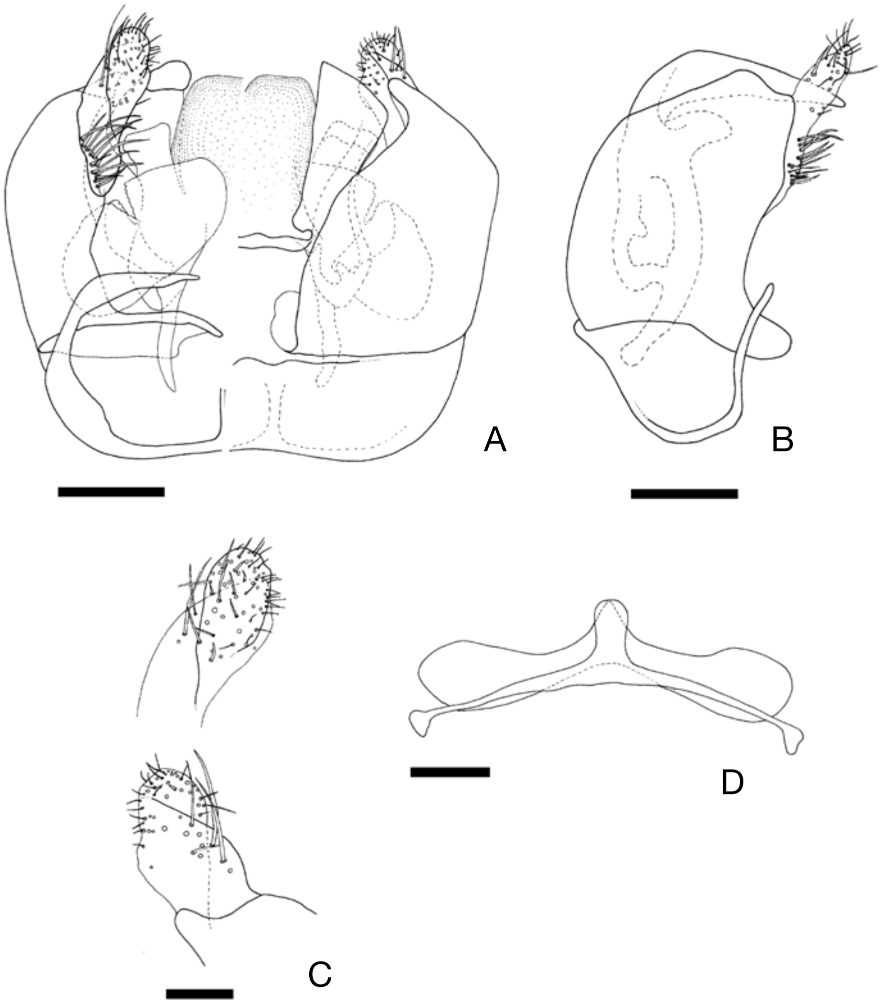

Fig. 35. *Lasioglossum (Evylaeus) solisortus* Ebmer et Maeta. A-C: male genitalia. D: S_{7-8}. A: left, ventral view; right, dorsal view. B: lateral view. C: gonostylus (upper, ventral view; lower, dorsal view). Scale: A, B, D, 0.2mm; C, 0.1mm.

absent.

Structure. Similar to female except as follows.

Head width slightly longer or as long as head length; head length/width ratio 0.96-1.0 (n= 5). Distance between lateral ocelli about 1.4 times the distance between lateral ocellus and compound eye. Clypeal length about 1.7 times the distance between lower rim of antennal socket and upper margin of clypeus. Clypeus rounded in lateral view, without reticulation over the surface. Basal area of labrum about 3.3 times as wide as long; basal elevation and distal process absent. Mandible edentate. Scape length 0.3-0.4 mm (n= 5), F_2 length about 2 times F_1.

Mesoscutellum (Fig. 33. L) medially depressed, with weak rugulae. Metanotum with coarse rugulae. Sculpture of propodeum coarser than in female; transverse carina distinct; propodeal side with coarse rugulae. Basitibial plate of hind leg marginally without carina. Inner hind tibial spur without distinct teeth.

T_1 (Fig. 59. C) medially with moderately dense granular PP (15 μø), and posteriorly with very weak transverse striation. T_2 basally and posteriorly with weak transverse striation. T_{3-4} with weak transverse striation over the surface. S_7 with moderately long and broad, apically truncate median process; S_8 with moderately long, and triangular median process (Fig. 35. D).

Male genitalia (Fig. 35. A-C). Gonobasal ventral arm ring-shaped, and not connected with each other at upper ends in ventral view; the bottom nearly flat. The surface of gonocoxite smooth, and the junction between gonostylus and the upper area of gonocoxite with long moderately dense bristles in ventral and lateral views. Gonostylus (Fig. 35. C) somewhat ovate in dorsal and ventral views, apically rounded, with sparse pores and short hairs, and mixed with a few long bristles.

Remarks. Similar species is not found from Japan. It is characteristic in having the head width longer than head length in both sexes, the mesoscutum dimly shiny with distinct reticulation over the surface in both sexes, the mesoscutellum weakly rugulose in male, and the metanotum with distinct reticulation in female.

Variation. The coloration of metasoma presents black and partly pale-red types in male (Fig. 33. M-O). In the latter, the red coloration appears on the basal areas of T_{2-5} or T_{2-4}. However, the color pattern of metasomal sterna variable.

Distribution. Japan (Ryukyus: Ishigaki-jima, Iriomote-jima).

Flight records. Female: February to May. Male: March to May.

Biology. Unknown.

Specimens examined. Holotype: female, Iriomote-jima, Okinawa Pref., Japan, 15. iii. 1974 (T. Naito, MCDS). Paratypes: 8 females and 1 male, same data with the holotype (MCDS & SCMH). *Other material.* [**JAPAN**] [**Ryukyus**] Ishigaki-jima, Okinawa Pref.: 1 female, Hirano, 6. iii. 1995 (T. Matsumura, SCMH); 1 female, Tamatorizaki, 6. iii. 1995 (T. Matsumura, SCMH); 3 females, Yonehara, 15. iii. 1964 (M. Yoshimoto & J. Harrell, ELKU); 1 female, Kainan, 8. ii. 1953 (T. Shiraki, ELKU); 1 female, Yonehara, 15. iii. 1964 (T. Shirôzu, ELKU). Iriomote-jima, Okinawa Pref.: 7 females, Amitori, 30. iii. 1989, 25. iii. 1999 (M. Iwata, ALKK); 2 females, Uehara, 25. iii. 1999 (M. Iwata, ALKK); 10 females, Ushiku-mori, 9. iii., 11. iii. 1964 (Y. Miyatake & S. Kimoto, ELKU); 1 female, Komi, 30. v. 2004 (A. Noda); 1 female and 1 male, Funaura, 15. iv. 1979 (H. Makihara, ELKU), 17. iii. 2005 (R. Murao); 2 females, Ôtomi, 20. ii. 1969 (M. Kinzyo, ELKU). 16. iii. 2005 (R. Murao); 2 females, Ôtomi-rindou, 16. iii. 2005 (R. Murao); 1 female and 2 males, Shirahama-rindou, 15. iii. 2005, 18. v. 2007 (R. Murao); 1 female, Sonai, 10. iii. 1964 (T. Shirôzu, ELKU); 5 males, Urauchi-kawa Shizenkenkyu-ro, 22. v. 2007 (R. Murao); 1 female, 14-17. iv. 2005 (Y. Maeta, MCDS).

vulsum species-subgroup

Lasioglossum (Evylaeus) baleicum (Cockerell, 1937)

(Figs. 36. A-L; 37. A-I; 38. A-E; 57. D; 59. D)

Halictus baleicus Cockerell, 1937, Amer. Mus. Novit., 949: 1-2 [female & male, Siberia: Ust Balei]; Hirashima, 1957, Sci. Bull. Fac. Agr., Kyushu Univ., 16 (1): 5.

Lasioglossum (Evylaeus) baleicum: Ebmer, 1978a, Ann. Hist.-nat. Mus. Hung., 70: 314; Ebmer, 1978b, Bonn. zool. Beitr., 29 (1-3): 203; Ebmer, 1995, Linzer biol. Beitr., 27 (2): 571; Ebmer, 1996, Linzer biol. Beitr., 28 (1): 280; Ikudome, 1999, Ident. Guide Aculeata Nansei Is., Jap.: 582-583; Ebmer, 2006, Linzer biol. Beitr., 38 (1): 558.

Redescription

Female. Body length 7.5–8.7 mm, wing length 6.6–7.5 mm (n= 5).

Color. Body black except as follows: mandible with apical half reddish brown; tegula posteriorly and marginally brownish semitransparent; tibial spur yellow; posterior margins of metasomal terga narrowly yellowish brown semitransparent. Wings nearly transparent; veins and pterostigma yellowish brown or brown.

Pilosity. Body hairs dull whitish to yellowish brown. Hairs on head finely branched, moderately dense. Hairs on mesosoma finely branched except as follows: lateral lobe of pronotum and medial area of metanotum with dense tomentose; hind trochanter and femur with plumose hairs, forming scopa. Hairs on anterior and lateral portions of T_1 finely branched, sparse. T_2 laterally and posteriorly with moderately dense simple and short hairs. T_{3-4} with moderately dense simple and short hairs over the surface, and mixed with a few fine branched hairs. T_5 with dense fine branched hairs. Basal hair bands present on T_{2-3}.

Structure. Head width distinctly longer than head length; head length/width ratio 0.88-0.92 (n= 10). Vertex behind ocelli with weak transverse ridges. Distance between lateral ocelli as long as the distance between lateral ocellus and compound eye. Frons and paraocular area dimly shiny, with cancellate PP (20-25 μø). Supraclypeal area (Figs. 36. C; 37. A) slightly convex in lateral view, weakly shiny, with sparse granular PP (20-25 μø); IS with very weak reticulation. Clypeal length about 1.3 times the distance between lower rim of antennal socket and upper margin of clypeus. Clypeus flat in lateral view, weakly shiny, with sparse granular PP (25-30 μø) on upper half, and with sparse larger shallow PP (40-60 μø) on lower half; IS with very weak reticulation on upper half, and without reticulation on lower half. Basal area of labrum about 2.3 times as wide as long; basal elevation well developed; lateral projection of distal process absent; keel of distal process moderately broad, apically bluntly pointed in frontal view; labral fimbria all acutely pointed at apex. Mandible bidentate. Hypostomal carina well developed; its anterior angle

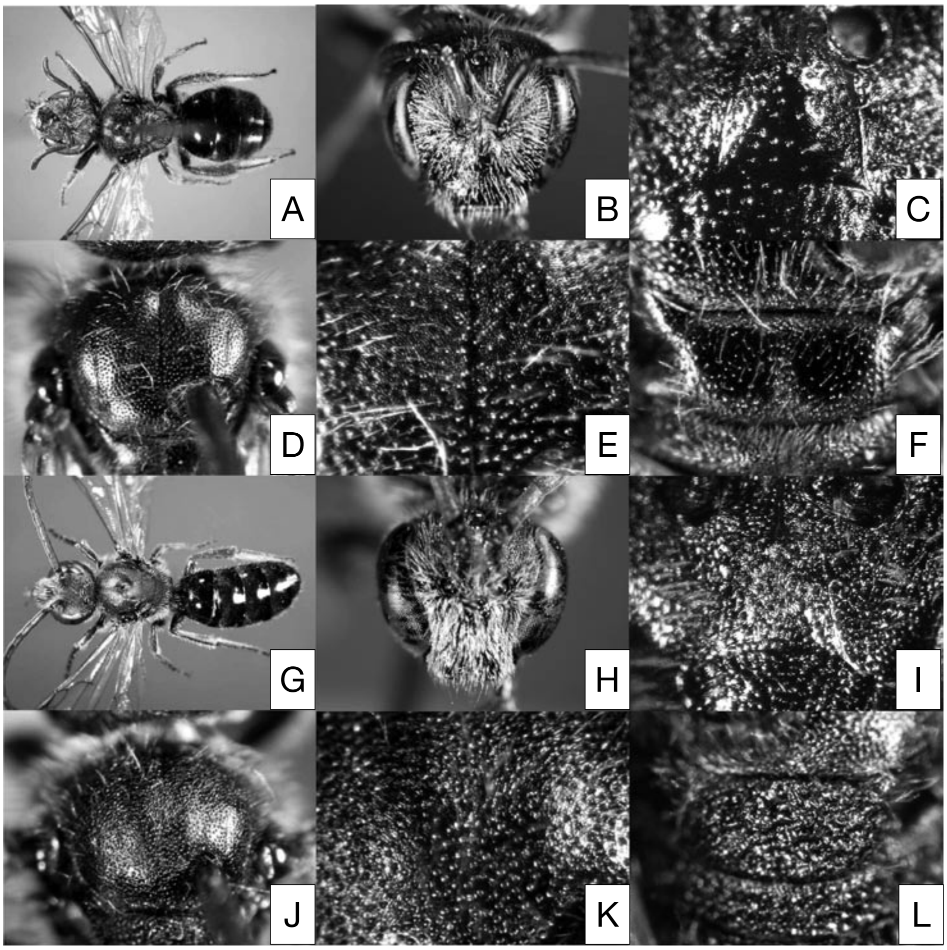

Fig. 36. *Lasioglossum (Evylaeus) baleicum* (Cockerell). A-F: female. G-L: male. A, G: general habitus. B, H: head in frontal view. C, I: supraclypeal area. D, J: mesoscutum. E, K: sculpture of mesoscutum. F, L: mesoscutellum.

obtuse. Postgena with weak reticulation. Scape length 0.9-1.0 mm (n= 5), F_1 length as long as F_2.

Pronotum with dorsolateral angle obtuse; lateral sulcus distinct. Mesoscutum (Fig. 36. D, E) weakly shiny, anteriorly and laterally with dense granular PP (20-25 μø), medially and posteriorly with moderately dense granular PP (20-25 μø); IS anterioly and laterally with distinct reticulation, medially and posteriorly with very weak reticulation or without reticulation. Mesoscutellum (Fig. 36. F) weakly shiny, marginally and longitudinally with homogeneous PP and IS in sculpture similar to mesoscutum. Metanotum with weak rugulae. Mesepisternum (Fig. 37. C) coarsely rugulose. Metepisternum with transverse ridges on upper half, with weak rugulae on lower half. Propodeum: the length of propodeal dorsum shorter than that of mesoscutum, and about 1.2 times that of metanotum; propodeum dorsolaterally with oblique ridges, and dorsomedially with somewhat sinuate ridges; transverse carina disitinct dorsoapically, but weak dorsolaterally; oblique carinae not connected with transverse carina at upper ends; propodeal side with distinct reticulation and weak rugulae; shield reticulate. Basitibial plate of hind leg marginally carinate. Inner hind tibial spur (Fig. 37. E) with 3-5 slender teeth (n= 30).

Metasomal terga weakly shiny. T_1 (Fig. 57. D) without striation over the surface, and medially with sparse fine PP (≦10 μø) (rather obscure PP). T_2 basally and medially with moderately dense fine PP (≦10 μø), basally and posteriorly with weak transverse striation. $T_{3\text{-}4}$ with moderately dense pores and with very weak transverse striation over the surface.

Male. Body length 6.8–7.9 mm, wing length 5.6–6.3 mm (n= 5).

Color. Similar to female except as follows: flagellum beneath blackish brown or brown.

Pilosity. Similar to female except as follows: lower half of paraocular area, supraclypeal area, and upper half of clypeus with dense tomentose; hairs on metanotum finely branched, sparse; hind trochanter and femur with sparse simple and fine branched hairs; metasomal terga with sparse short hairs; basal hair bands absent.

Structure. Similar to female except as follows.

Head shape variable; head length/width ratio 0.95-1.02 (n= 10). Vertex behind ocelli with rugulae. Distance between lateral ocelli about 1.2 times the distance between lateral ocellus and compound eye. Supraclypeal area (Figs. 36. I; 37. F) with moderately dense granular PP (20 μø); IS with distinct reticulation. Clypeal length about 1.4 times the distance between lower rim of antennal socket and upper margin of clypeus. Clypeus with moderately dense granular PP (30 μø) and IS without reticulation over the surface. Basal area of labrum about 3.2 times as wide as long; basal elevation and distal process absent. Mandible edentate. Scape length 0.3–0.5 mm (n= 5), F_2 length about 2.6 times F_1.

Mesoscutellum (Fig. 36. L) and metanotum with coarse rugulae. The length of propodeal dorsum about 1.5 times that of metanotum; sculptures of propodeum coarser than in female: propodeal dorsum (Fig. 37. I) with irregular sinuate ridges over the surface. Basitibial plate of hind leg marginally without carina. Inner hind tibial spur without distinct teeth.

T_1 (Fig. 59. D) medially with moderately dense fine PP (≦10 μø). $T_{2\text{-}3}$ basally and medially with moderately dense granular PP (15-20 μø), and posteriorly with very weak transverse striation. S_7 with long, apically rounded or truncate median process; S_8 with moderately long, apically rounded or truncate median process (Fig. 38. E).

Male genitalia (Fig. 38. A-D). Gonobasal ventral arm ring-shaped, and connected with each other at upper ends in ventral view; the bottom distinctly depressed. The surface of gonocoxite smooth. Gonostylus (Fig. 38. C) rounded, with moderately dense pores and sparse short hairs. Ventral retrorse lobe (Fig. 38. D) long and slender, with dense short hairs, the shape similar to

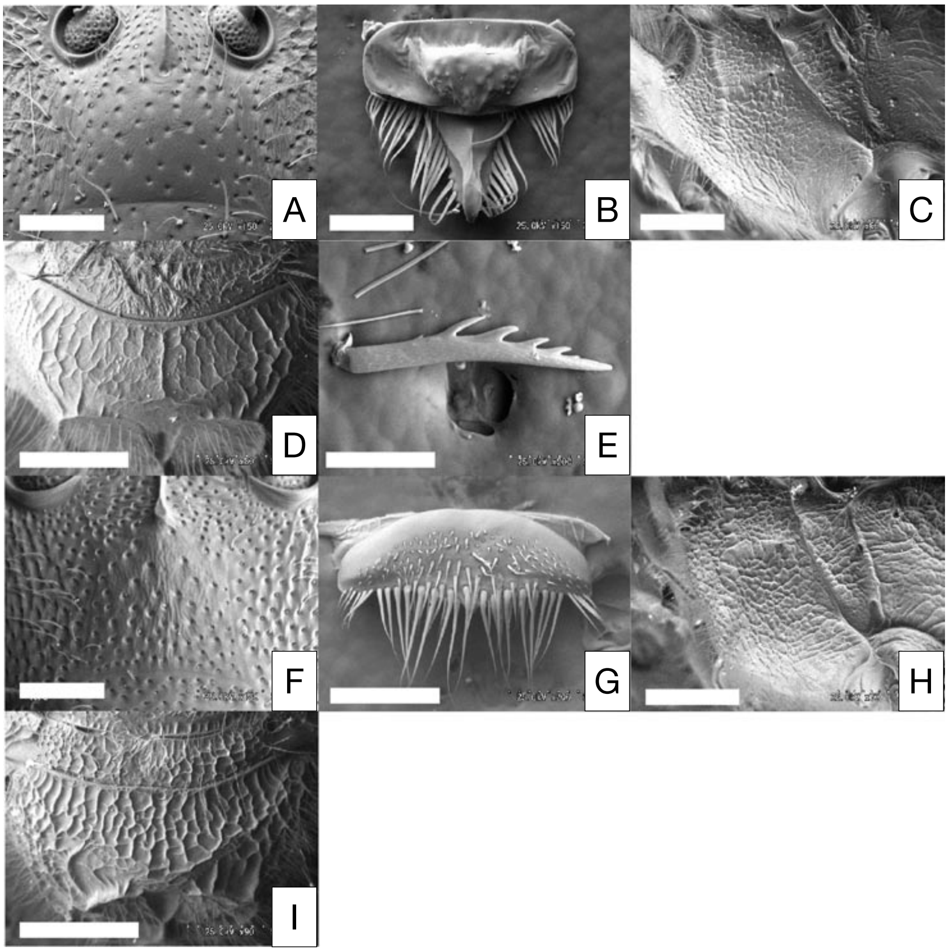

Fig. 37. *Lasioglossum (Evylaeus) baleicum* (Cockerell). A-E: female. F-I: male. A, F: supraclypeal area. B, G: labrum. C, H: mesepisternum. D, I: propodeal dorsum. E: inner hind tibial spur. Scale: C, D, H, I, 0.5mm; F, 0.25mm; A, B, E, G, 0.2mm.

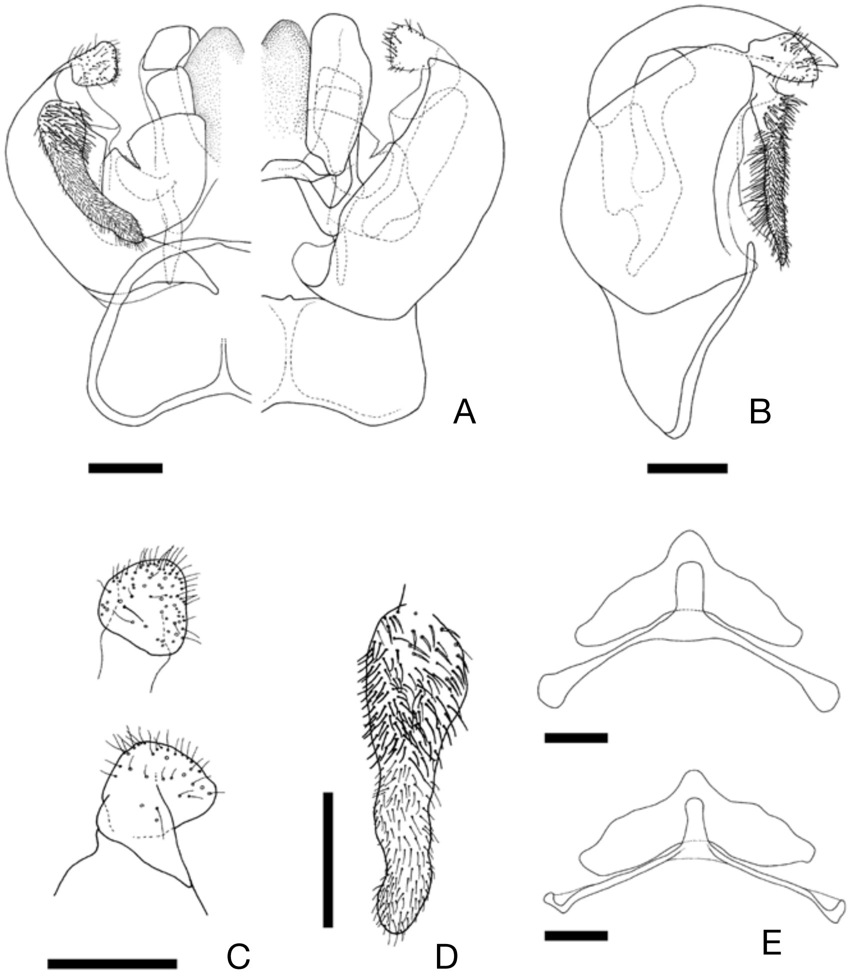

Fig. 38. *Lasioglossum (Evylaeus) baleicum* (Cockerell). A-D: male genitalia. E: S7-8. A: left, ventral view; right, dorsal view. B: lateral view. C: gonostylus (upper, ventral view; lower, dorsal view). D: ventral retrorse lobe. Scale: A-E, 0.2mm.

Lasioglossum (Evylaeus) vulsum (Vachal) and *L.(E.) subtropicum* Sakagami, Miyanaga et Maeta.

Variation. The lower half of clypeus generally black, but some specimens show slightly dark yellow on lower margin in male. Also, tibiae and tarsi in male generally black or blackish brown, sometimes tibiae slightly yellow on basal and apical areas, and tarsi yellowish brown.

Remarks. In Japan, this species is closely similar to *Lasioglossum (Evylaeus) caliginosum* Murao, Ebmer et Tadauchi and *L. (E.) vulsum* (Vachal), but can be separated from the former by the longer distance between vertex and posterior ocelli [*L. (E.) baleicum* 0.11-0.14 mm; *L. (E.) caliginosum* 0.04-0.07 mm) in female, the shape of female labrum, the sculptures of mesoscutellum coarser than in *L. (E.) caliginosum* in male, the bottom of gonobasal ventral arm medially depressed, the gonostylus rounded in ventral view, and the ventral retrorse lobe slender; from the latter by the the longer distance between vertex and posterior ocelli [*L. (E.) baleicum* 0.11-0.14 mm; *L. (E.) vulsum* 0.03-0.05 mm] in female, the supraclypeal area with sparse PP in female, the clypeus usually black over the surface in male, the shape of female labrum, the flagellum beneath blackish brown or brown in male, the tibiae black in male, the mesoscutellum with coarse rugulae in male, and the gonostylus rounded in ventral view.

Distribution. China (northeast), Russian Far East (Siberia, Sakhalin, Primorsky), Korean Peninsula (south), Japan [Hokkaido, Honshu, Shikoku, Kyushu, Ryukyus (Yaku-shima)].

Flight records. Female: late March to October. Male: late June to early October.

Biology. See Cronin & Hirata (2003).

Specimens examined. [**JAPAN**] We have examined 92 females and 49 males from the following localities in Japan: Hokkaido, Aomori, Iwate, Niigata, Tochigi, Ibaraki, Tokyo, Yamanashi, Nagano, Fukui, Toyama, Ishikawa, Gifu, Wakayama, Kyoto, Hyogo, Tottori, Hiroshima, Tokushima, Ehime, Oita, Kumamoto, Kagoshima Prefectures. Some of the specimens examined are listed as follows: [**Hokkaido**] 8 females, Botanical Garden, Sapporo, 14. viii. 1959, 25-26. vi. 1966, 20. vii. 1966 (S. F. Sakagami & M. Shiokawa, SCMH); 3 males, Ikomanbetsu, Mt. Daisetsu, 23-25. vii. 1955 (Y. Hirashima, ELKU). [**Honshu**] Iwate Pref.: 2 females, Kuriyagawa, Morioka, 26. iv. 1968 (Y. Maeta, ELKU). Tokyo: 1 female, Mt. Takao-san, Hachiouji-shi, 17. x. 2003 (R. Murao); 2 females, Shiroyama, Hachiouji-shi, 25. viii. 1986 (K. Ishida, SCMH). Fukui Pref.: 2 males, Mt. Akausagi-yama, Ôno-shi, 25. ix. 2002 (K. Mitai). Nagano Pref.: 2 males, Karuizawa, 6. ix. 1949 (R. Ishii, ELKU). Toyama Pref.: 1 female, Nakane, Yatsuo-machi, 17. vi. 1975 (O. Tadauchi, ELKU). Gifu Pref.: 1 female, Akigami, 20. vii. 1978 (Y. Morimoto, SCMH). Hiroshima Pref.: 1 female, Miyano, Hiroshima-shi, 15. iv. 1975 (O. Tadauchi, ELKU). [**Shikoku**] Tokushima Pref.: 1 female, Komi, Ichiu-mura, 17. iv. 1976 (O. Tadauchi, ELKU); Ehime Pref.: 1 male, Mt. Sara, 10. ix. 1951 (Y. Hirashima, ELKU). [**Kyushu**] Kumamoto Pref.: 2 females and 2 males, Kusasenri, Aso-gun, 12. ix., 16. ix. 2004 (T. Sugimoto). [**Ryukyus**] Kagoshima Pref.: 1 female, Anbo, Yaku, Yaku-shima, 29. iv. 2005 (O. Tadauchi).

[**RUSSIAN FAR EAST**] 1 female, SU-Primorsky, 8. vii. 1993 (OLML); 2 females, Tigrevij, SSR-Primorsky, 1990 (Snizek, OLML). [**SOUTH KOREA**] 3 females, Mt. Hanna, Shiitakegoya (800m)-Ryuzinkaku (1600m), Cheju Is., 16. vii. 1968 (T. Shirôzu, ELKU); 4 males, Yonsil, Mt. Halla-san, Cheju Is., 27. vii. 1990 (O. Tadauchi, ELKU).

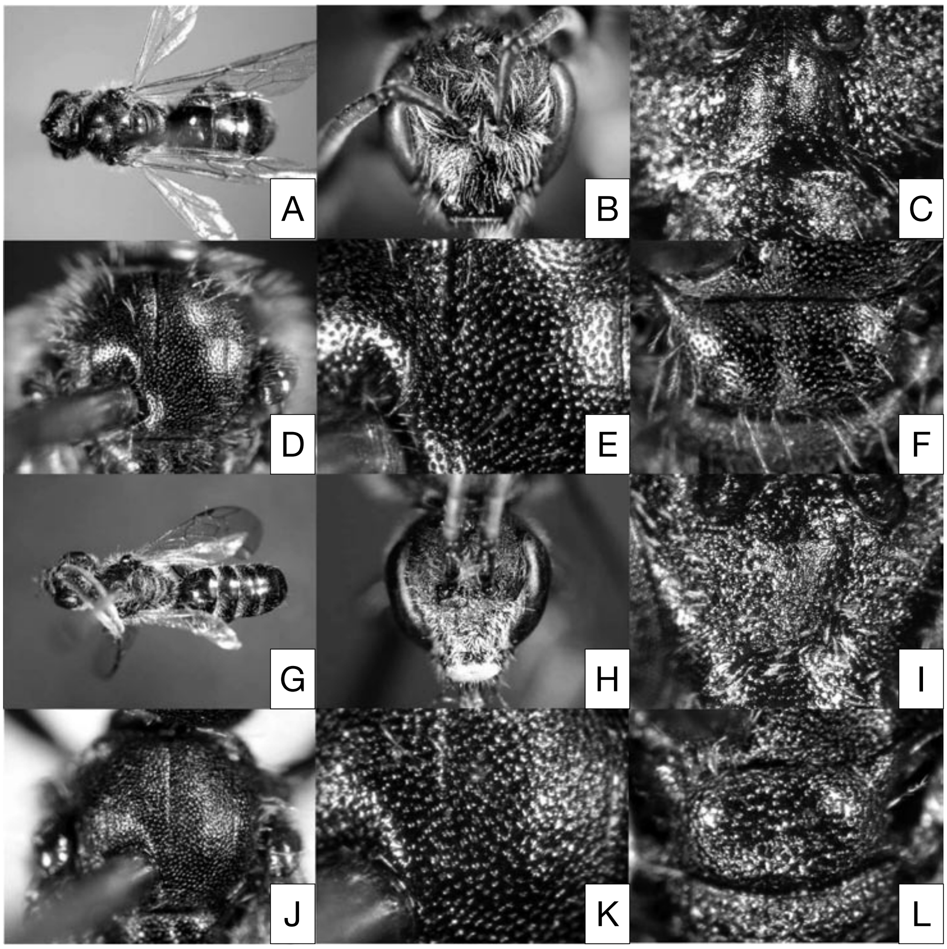

Fig. 39. *Lasioglossum (Evylaeus) boreale* Svensson, Ebmer et Sakagami. A-F: female. G-L: male. A, G: general habitus. B, H: head in frontal view. C, I: supraclypeal area. D, J: mesoscutum. E, K: sculpture of mesoscutum. F, L: mesoscutellum.

Lasioglossum (Evylaeus) boreale Svensson, Ebmer et Sakagami, 1977

(Figs. 39. A-L; 40. A-K; 41. A-E; 57. E; 59. E)

Lasioglossum (Evylaeus) boreale Svensson, Ebmer et Sakagami, 1977, Entomol. Scand., 8 (3): 219-229 [female & male, Sweden]; Sakagami & Toda, 1986, Canad. Entomol., 118 (5): 397-399; Ebmer, 1995, Linzer biol. Beitr., 27 (2): 574-575; Tadauchi et al., 1998, Nat. Hist. Bull. Ibaraki Univ., 2: 232-233.

***Diagnosis*. Female**: body length, 5.6-7.5 mm (n= 5); head width as long as or slightly longer than head length, head length/width ratio 0.99-1.0 (n= 10); supraclypeal area (Figs. 39. C; 40. A) with sparse or moderately dense granular PP (20 μø) and IS with distinct reticulation as in male; mesoscutum (Fig. 39. D, E) with dense granular PP (20-25 μø), IS anteriorly and medially with distinct reticulation and posteriorly with weak reticulation; mesepisternum (Fig. 40. C) above with weak rugulae; the length of propodeal dorsum shorter than that of mesoscutellum as in male, and about 1.4 times that of metanotum; transverse carina of propodeum indistinct; propodeum dorsomedially with longitudinal ridges; inner hind tibial spur (Fig. 40. G) with 2-5 slender teeth (n= 5); T_1 (Fig. 57. E) without striation over the surface, and medially with sparse fine PP (≦10 μø) (rather obscure PP). **Male**: body length, 6.5-7.2 mm (n= 5); head length distinctly longer than width, head length/width ratio 1.07-1.15 (n= 10); flagellum beneath yellow; F_2 length about 1.8 times F_1; lower half of clypeus yellow; mesoscutum (Fig. 39. J, K) weakly shiny or somewhat dimly shiny, with weak cancellate PP (20-35 μø), IS anteriorly and medially with distinct reticulation and posteriorly with weak reticulation; the length of propodeal dorsum about 1.2 times that of metanotum;

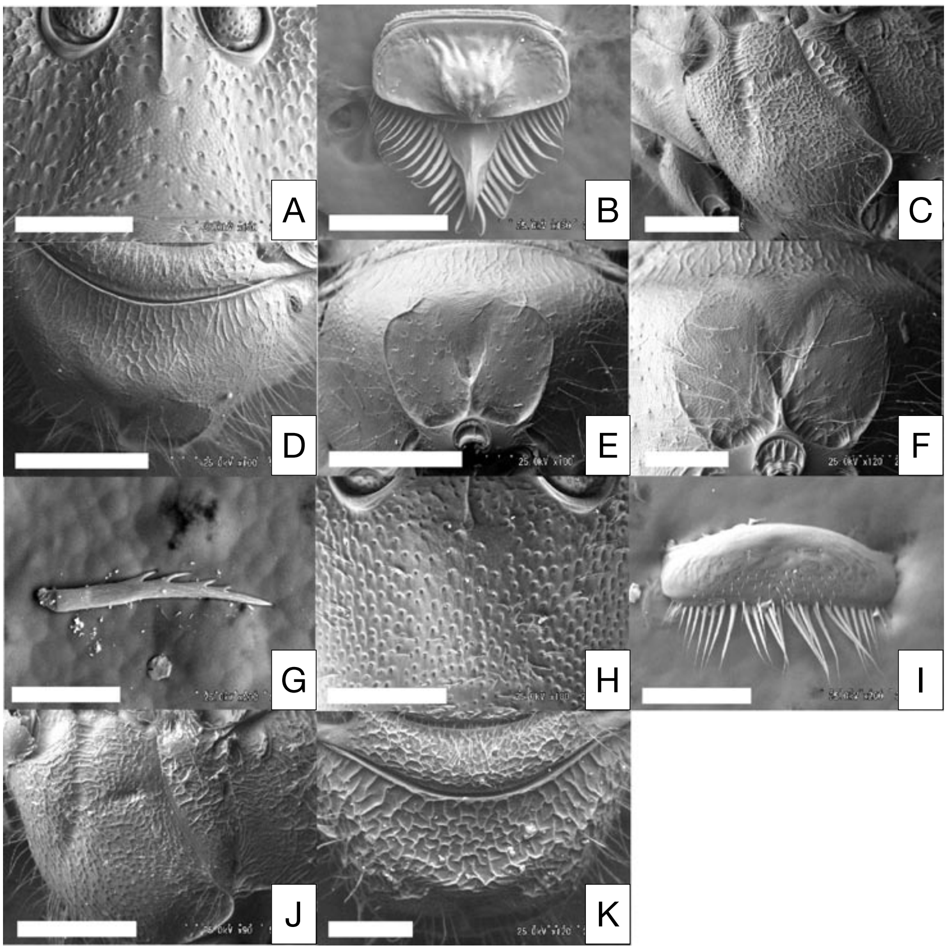

Fig. 40. *Lasioglossum (Evylaeus) boreale* Svensson, Ebmer et Sakagami. A-G: female. H-K: male. A, H: supraclypeal area. B, I: labrum. C, J: mesepisternum. D, K: propodeal dorsum. E, F: shield of propodeum. G: inner hind tibial spur. Scale: C-E, J, 0.5mm; A, B, F, H, K, 0.25mm; G, I, 0.2mm.

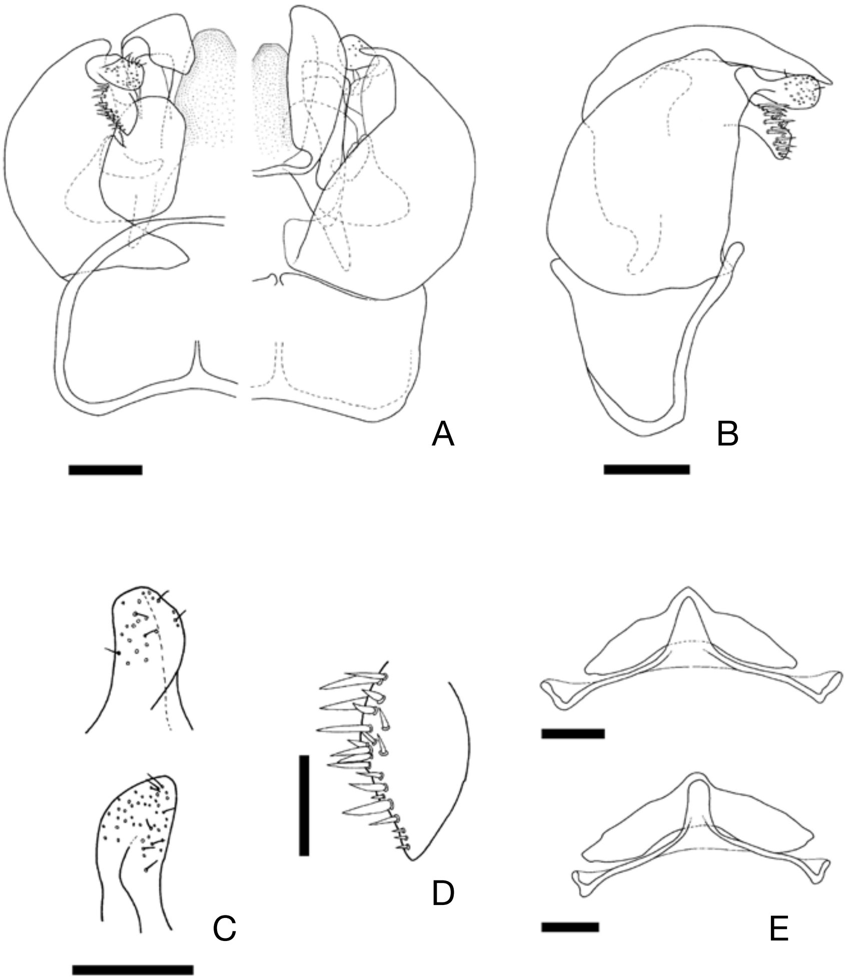

Fig. 41. *Lasioglossum (Evylaeus) boreale* Svensson, Ebmer et Sakagami. A-D: male genitalia. E: S_{7-8}. A: left, ventral view; right, dorsal view. B: lateral view. C: gonostylus (upper, ventral view; lower, dorsal view). D: ventral retrorse lobe. Scale: E (lower), 0.25mm; A-C, E (upper), 0.2mm; D, 0.1mm.

propodeal dorsum (Fig. 40. K) with coarse irregular sinuate ridges over the surface; all tibiae basally and apically yellow; basitibial plate of hind leg marginally without carina; all tarsi yellowish brown; T_1 (Fig. 59. E) without striation over the surface, and medially with moderately dense granular PP (15-20 μø).

In Japan, this species is relatively similar to *Lasioglossum (Evylaeus) nupricola* Sakagami, but can be separated from it by the head width as long as or slightly longer than head length (head length/width ratio 0.99-1.0) in female, the mesocutum weakly shiny in female, all tibiae basally and apically yellow in male, all tarsi yellow in male, mesoscutum and mesoscutellum weakly or moderately shiny in male, the IS of mesoscutum without reticulation on posterior area in male, the mesoscutellum with granular PP in male, and the ventral retrorse lobe of male genitalia short.

In Holarctic Region excluding Japan, this species is closely similar to *L. (E.) austriacum* Ebmer from Europe, *L. (E.) subfulvicorne* (Blüthgen) from China (Kansu Province), and *L. (E.) comagenense* Knerer et Atwood from North America (Ontario, Alaska). As to the differences among *L. (E.) boreale* and the three allied species, see Svensson *et al.* (1977) and Sakagami & Toda (1986).

Supplementary description

Female labrum (Fig. 40. B): basal area about 2.1 times as wide as long; basal elevation well developed; lateral projection of distal process absent; keel of distal process narrow, apically pointed in frontal view; labral fimbria all acutely pointed at apex. Male labrum (Fig. 40. I): basal area about 2.8 times as wide as long; basal elevation and distal process absent.

Male genitalia (Fig. 41. A-D). Gonobasal ventral arm ring-shaped, and connected with each other at upper ends in ventral view; the bottom medially slightly depressed. The surface of gonocoxite smooth. Gonostylus (Fig. 41. C) club-like, with sparse spots and short hairs. Ventral retrorse lobe (Fig. 41. D) short, with sparse short bristles laterally.

Variation and *Biology*. See Svensson *et al.* (1977).

Distribution. Northern and Arctic Sweden, Northern Japan (Hokkaido), Northern and Arctic Canada. In addition, Packer & Taylor (2002) recorded this species from U. S. A. (Arizona, New Hampshire).

Flight records. Female: late May to August. Male: August to early September.

Comments. According to the comments by Sakagami & Toda (1986), this species is probably conspecific either with the male of *Halictus peraltus* recorded from New Mexico or the female of *H. dasiphorae* from New Mexico, both described by Cockerell (1901), and that the problems should be solved by McGinley. We could not solve this taxonomic problem in this study.

Specimens examined. Paratypes: [**JAPAN**] [**Hokkaido**] 4 females and 6 males, Sugatami, 23. vi., 22. viii., 6. ix. 1967 (SCMH). [**SWEDEN**] 4 females and 1 male, Abisco, 10. viii. 1974, 29. v-5. vi. 1975, 4. vi. 1975, 19-25. vi. 1975 (Svensson, SCMH). *Other material*: [**CANADA**] 4 females and 19 males, Inuvik, 5. viii., 7. viii., 10. viii. 1980 (M. Toda, SCMH). [**U. S. A**] 1 male, Mt. Washington, N. H. 4500 ft., 22. viii. 1968 (G. Knerer, SCMH).

Lasioglossum (Evylaeus) caliginosum Murao, Ebmer et Tadauchi, 2006

(Figs. 42. A-L; 43. A-I; 57. F; 59. F)

Lasiglossum (Evylaeus) caliginosum Murao, Ebmer et Tadauchi, 2006, Esakia, (46): 36-42 [female & male, Japan: Hokkaido]; Ebmer, 2006, Linzer biol. Beitr.,

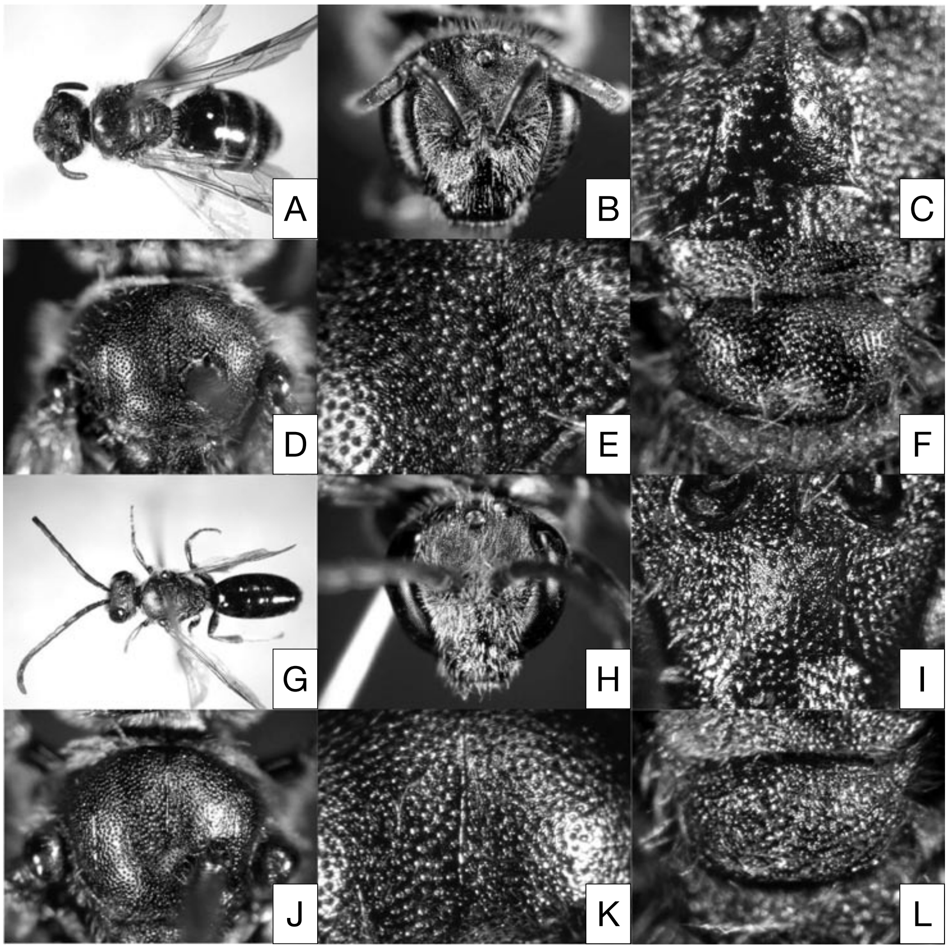

Fig. 42. *Lasioglossum (Evylaeus) caliginosum* Murao, Ebmer et Tadauchi. A-F: female. G-L: male. A, G: general habitus. B, H: head in frontal view. C, I: supraclypeal area. D, J: mesoscutum. E, K: sculpture of mesoscutum. F, L: mesoscutellum.

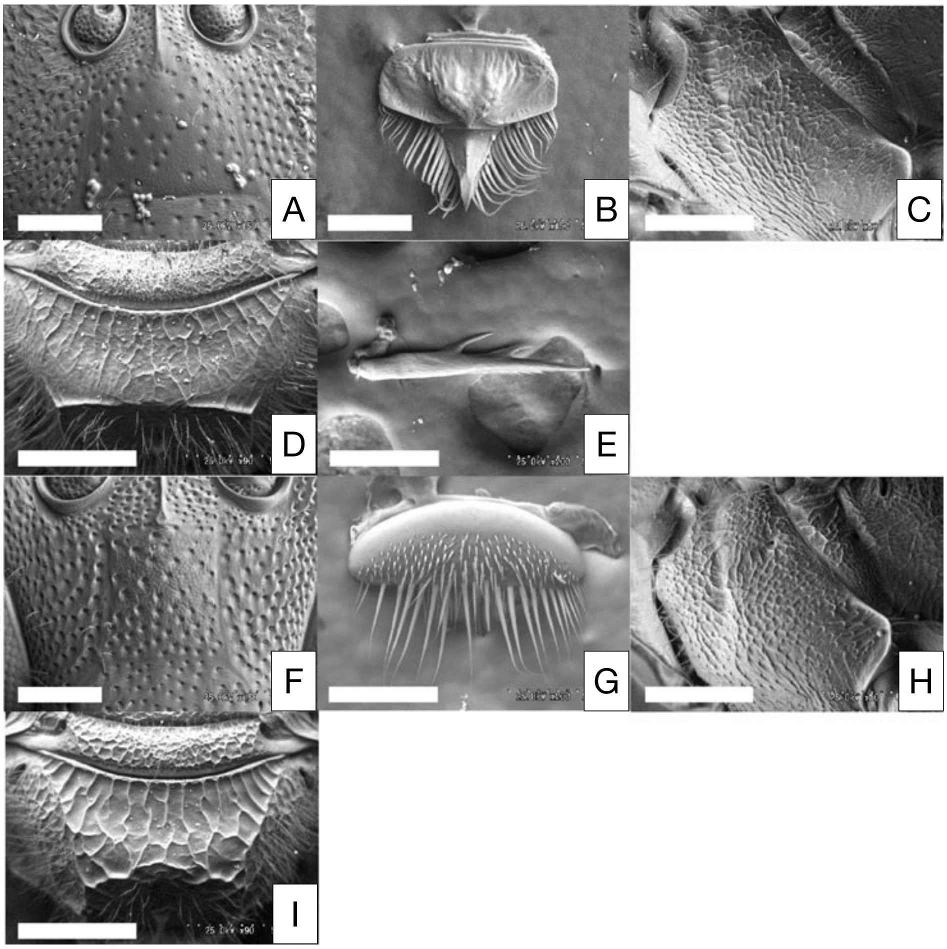

Fig. 43. *Lasioglossum (Evylaeus) caliginosum* Murao, Ebmer et Tadauchi. A-E: female. F-I: male. A, F: supraclypeal area. B, G: labrum. C, H: mesepisternum. D, I: propodeal dorsum. E: inner hind tibial spur. Scale: C, D, H, I, 0.5mm; A, B, E-G, 0.2mm.

38 (1): 558-559.

Diagnosis. **Female**: body length, 6.1-7.0 mm (n=5); head width distinctly or slightly longer than head length, head length/width ratio 0.91-0.99 (n= 10); supraclypeal area (Figs. 42. C; 43. A) with sparse granular PP (25-30 μø), but sometimes with moderately dense PP; mesoscutum (Fig. 42. D, E) with dense granular PP (15-25 μø) and IS with distinct reticulation over the surface as in male; mesepisternum (Fig. 43. C) weakly shiny, with coarse rugulae as in male; the length of propodeal dorsum as long as mesoscutellum as in male, and about 2 times that of metanotum; propodeal dorsum (Fig. 43. D) with irregular sinuate ridges over the surface as in male; inner hind tibial spur (Fig. 43. E) with 2-6 slender teeth (n= 128); T_1 (Fig. 57. F) medially with sparse fine PP (≦ 10 μø) (rather obscure PP). **Male**: body length, 6.6-7.0 mm (n= 5); head width slightly longer or as long as head length, head length/width ratio 0.98-1.0 (n= 10); clypeus slightly dark yellow on lower margin or entirely black over the surface; flagellum beneath blackish brown; F_2 length about 2.5 times F_1; mesoscutellum (Fig. 42. L) with weak rugulae; the length of propodeal dorsum about 1.5 times that of metanotum; all tibiae and tarsi black or brown; basitibial plate of hind leg marginally without carina; T_1 (Fig. 59. F) without striation over the surface, and medially with moderately dense fine PP (10-15 μø); gonostylus ovate in dorsal and ventral views; ventral retrorse lobe broad, with moderately dense short hairs.

In Japan, this species is closely similar to *Lasioglossum (Evylaeus) baleicum* (Cockerell) and *L. (E.) vulsum* (Vachal), but it can be separated from the former by the shorter distance between vertex and posterior ocelli [*L. (E.) caliginosum* 0.04-0.07 mm, n= 10; *L. (E.) baleicum* 0.11-0.14 mm, n= 10] in female, the shape of female labrum, the sculpture of mesoscutellum not coarser than in *L. (E.) baleicum* in male, the bottom of gonobasal ventral arm medially nearly flat, the gonostylus ovate, and the ventral retrorse lobe broad; from the latter by the shape of female labrum, the clypeus slightly dark yellow on lower margin or entirely black over the surface in male, all tibiae and tarsi black or brown in male, the gonostylus ovate, and the ventral retrorse lobe broad.

Description. See Murao *et al*. (2006).

Distribution. Russian Far East (Primorsky), Japan (Hokkaido, Honshu, Shikoku, Kyushu).

Flight records. Female: April to October. Male: August to October.

Biology. Unknown.

Specimens examined. [**JAPAN**] [**Hokkaido**] 2 males, Botanical Garden, Sapporo, 7. ix. 1959 (S. F. Sakagami, SCMH). [**Kyushu**] 4 males, Mt. Kujyu, Oita Pref., 29. viii. 1978 (ELKU). See Murao *et al*. (2006) for other specimens examined.

Lasioglossum (Evylaeus) nupricola Sakagami, 1988

(Figs. 44. A-L; 45. A-I; 46. A-E; 57. G; 59. G)

Lasioglossum (Evylaeus) nupricola Sakagami, 1988, Kontyû, 56 (2): 337-347 [female & male, Japan: Hokkaido]; Ebmer, 1995, Linzer biol. Beitr., 27 (2): 573; Tadauchi et al., 1998, Nat. Hist. Bull. Ibaraki Univ., 2: 234-235; Ebmer, 2006, Linzer biol. Beitr., 38 (1): 562.

Diagnosis. **Female**: body length, 6.7-8.3mm (n=5); head length distinctly longer than head width as in male, head length/width ratio 1.05-1.09 (n= 10); supraclypeal area (Figs. 44. C; 45. A) dimly shiny, with sparse granular PP (20 μø) and IS with distinct reticulation as in male; mesoscutum (Fig. 44. D, E) dimly shiny, with dense granular PP (20 μø) and IS with distinct reticulation over the surface as in male; the length of propodeal

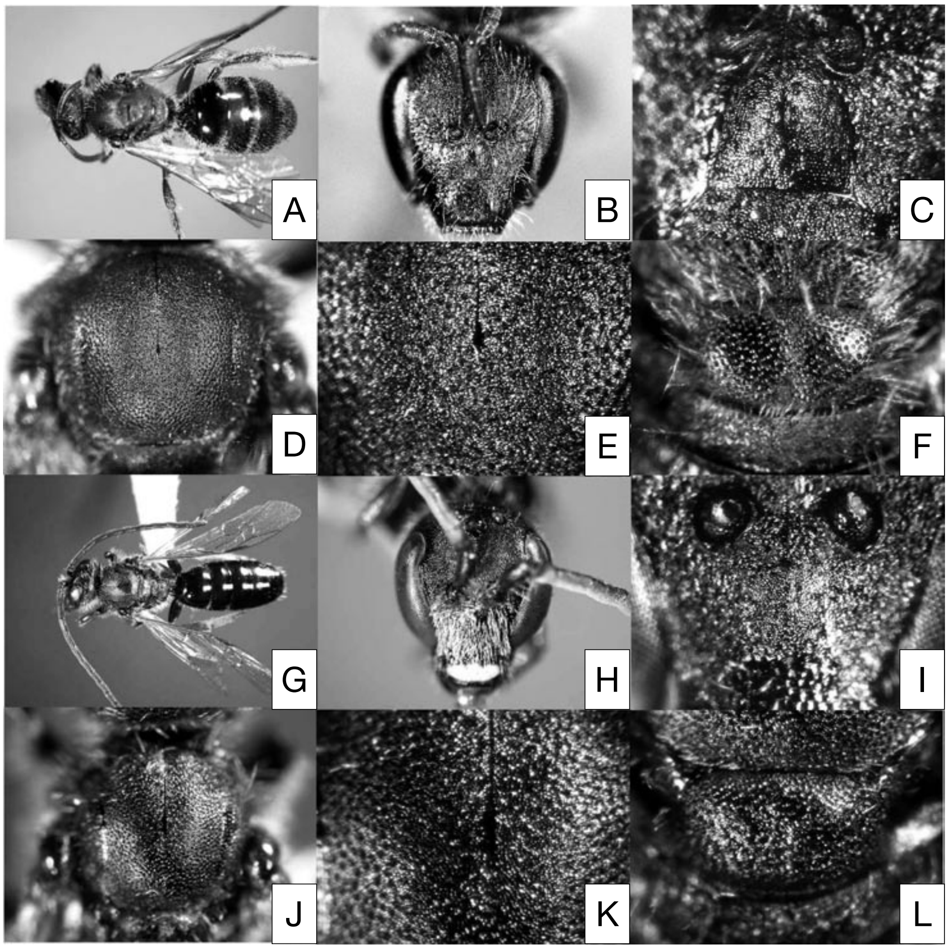

Fig. 44. *Lasioglossum (Evylaeus) nupricola* Sakagami. A-F: female. G-L: male. A, G: general habitus. B, H: head in frontal view. C, I: supraclypeal area. D, J: mesoscutum. E, K: sculpture of mesoscutum. F, L: mesoscutellum.

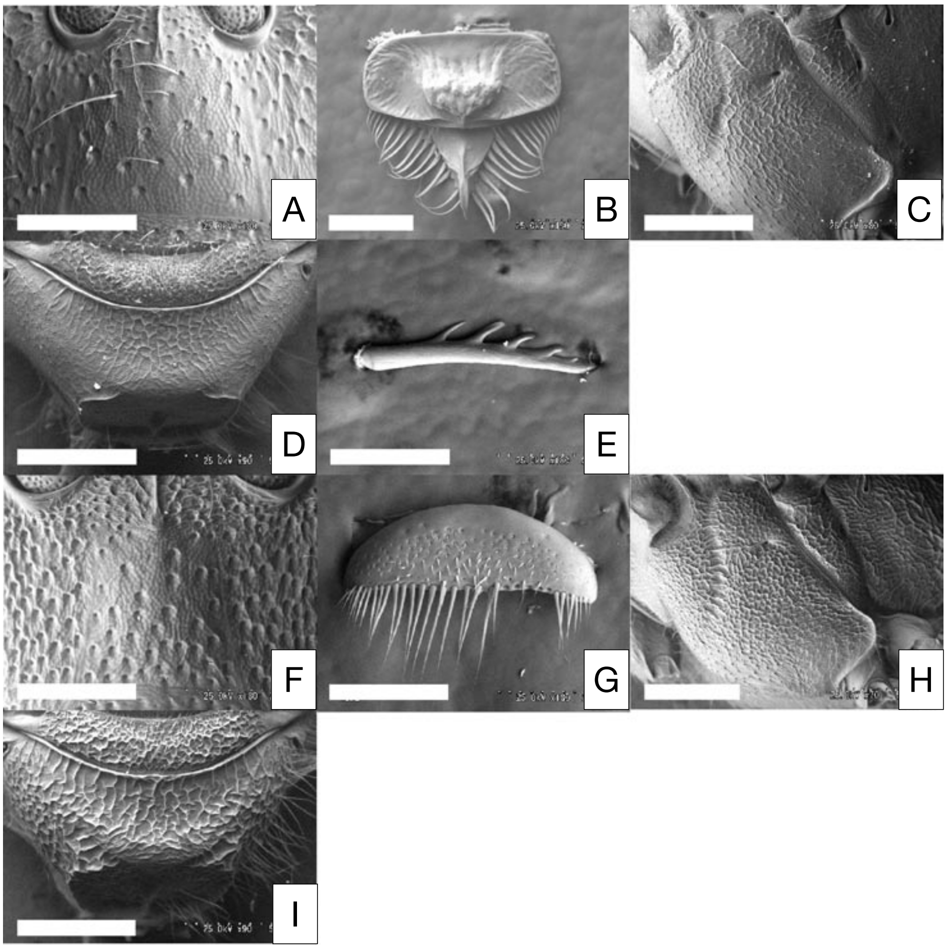

Fig. 45. *Lasioglossum (Evylaeus) nupricola* Sakagami. A-E: female. F-I: male. A, F: supraclypeal area. B, G: labrum. C, H: mesepisternum. D, I: propodeal dorsum. E: inner hind tibial spur. Scale: C, D, H, I, 0.5mm; A, E-G, 0.25mm; B, 0.2mm.

dorsum shorter than that of mesoscutellum, and about 1.4 times that of metanotum; propodeum dorsomedially with irregular sinuate ridges as in male; inner hind tibial spur (Fig. 45. E) with 3-6 slender teeth (n= 20); T_1 (Fig. 57. G) nearly smooth. **Male**: body length, 7.2-7.7mm (n=5); head length/width ratio 1.09-1.17; lower half of clypeus yellow; flagellum beneath yellowish brown; F_2 length about 2.4 times F_1; mesoscutellum (Fig. 44. L) dimly shiny, with cancellate PP (20-30 μø) or weak rugulae; the length of propodeal dorsum shorter than that of mesoscutellum, and about 1.6 times that of metanotum; all tibiae and tarsi black; basitibial plate of hind leg marginally without carina; T_1 (Fig. 59. G) without striation over the surface, medially and posteriorly with moderately dense granular PP (15-20 μø).

In Japan, this species is relatively similar to *Lasioglossum (Evylaeus) boreale* Svensson, Ebmer et Sakagami, but can be separated from it by the head length distinctly longer than head width (head length/width ratio 1.05-1.09) in female, mesoscutum dimly shiny in both sexes, all tibiae and tarsi black or blackish brown in male, the IS of mesoscutum with distinct reticulation over the surface in male, the mesoscutellum with cancellate PP or weak rugulae in male, and the ventral retrorse lobe long.

In Palaearctic Region excluding Japan, this species is closely similar to *L. (E.) fratellum fratellum* (Pérez) from Europe and *L. (E.) fratellum betulae* Ebmer from Korean Peninsula (north). As to the differences between *L. (E.) nupricola* and *L. (E.) fratellum*, see Sakagami (1988).

This species was synonymized with *L. (E.) fratellum betulae* based on the continental populations by Pesenko (2007). Pesenko examined a large amount of materials from the south of the Russian Far East and permitted to conclude that the subtle differences between these taxa indicated by Sakagami (1988) widely overlap in the continental populations. However, he did not examine the

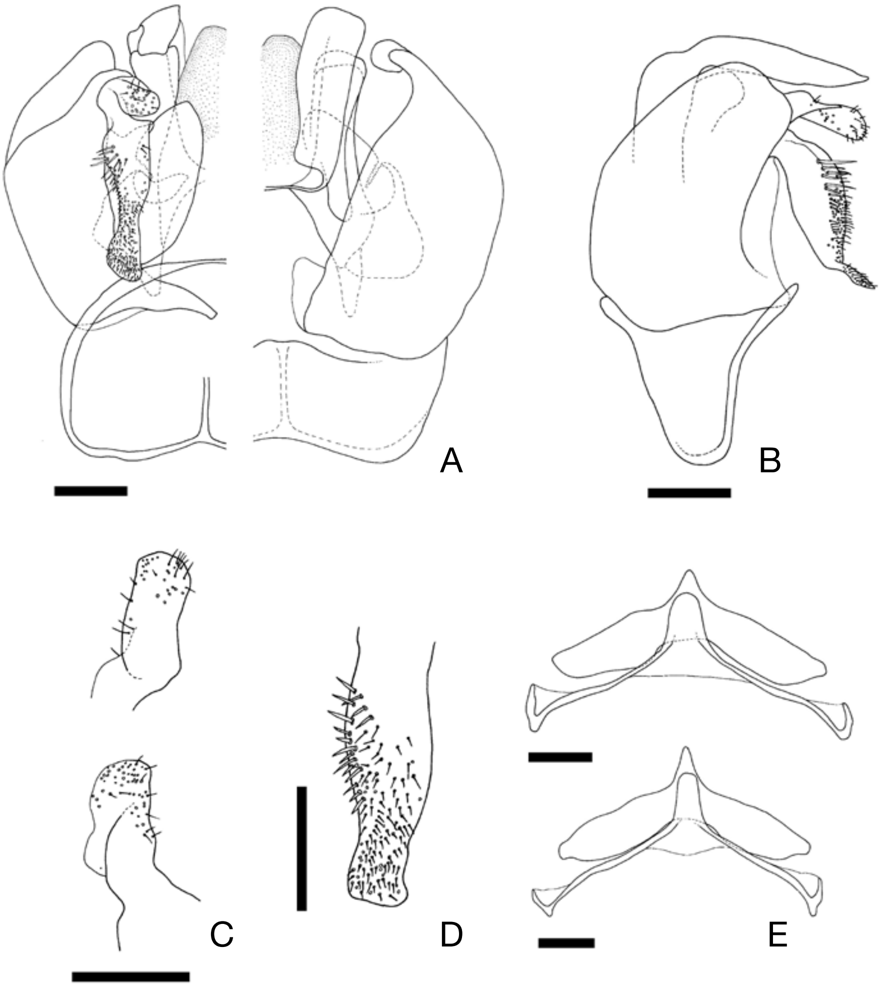

Fig. 46. *Lasioglossum (Evylaeus) nupricola* Sakagami. A-D: male genitalia. E: S7-8. A: left, ventral view; right, dorsal view. B: lateral view. C: gonostylus (upper, ventral view; lower, dorsal view). D: ventral retrorse lobe. Scale: A-E, 0.2mm.

Japanese population (type locality) of *L. (E.) nupricola*. As far as we could examined 27 males of *L. (E.) nupricola* (26 males from various localities in Japan; 1 male from Kurile Islands in Russian Far East), and 6 males of *L. (E.) fratellum betulae* from Cheju Island in South Korea (new record, Murao & Tadauchi, unpublished), at least the male genitalia which separates these taxa (Sakagami, 1988), is not overlapped as indicated by Pesenko. Although, we could not examined male materials of these taxa from the continental populations. We retain the status of *L. (E.) nupricola* as a good species as far as the detailed comarative study is conducted among *L. (E.) fratellum betulae*, and the continental and Japanese populations of *L. (E.) nupricola*.

Supplementary description

Female labrum (Fig. 45. B): basal area about 2.2 times as wide as long, apically slightly depressed in frontal view; basal elevation well developed; lateral projection of distal process absent; keel of distal process narrow and apically pointed in frontal view; labral fimbria all acutely pointed at apex. Male labrum (Fig. 45. G): basal area about 3 times as wide as long; basal elevation and distal process absent.

Male genitalia (Fig. 46. A-D). Gonobasal ventral arm ring-shaped, and connected with each other at upper ends in ventral view; the bottom medially slightly depressed. Surface of gonocoxite smooth. Gonostylus (Fig. 46. C) rod-like, with sparse spots and short hairs. Ventral retrorse lobe (Fig. 46. D) long and apically truncate, from basally to medially broad in lateral view; its surface basally with sparse short bristles, medially and apically with moderately dense short hairs.

Variation and *Biology*. See Sakagami (1988).

Distribution. Russian Far East (Kamchatka, Sakhalin, Primorsky, Kurile Islands), Japan (Hokkaido, northern and central parts of Honshu).

Flight records. Female: June to September. Male: July to September.

Specimens examined. Paratypes. [**JAPAN**] [**Hokkaido**] 2 females, Atsanupri (SCMH); 5 females, Mt. Iwozan, Kawayu, 5. vii. 1960, 20. vii. 1965 (S. F. Sakagami, SCMH); 1 female, Mt. Muine, 1460m (H. Fukuda, SCMH); 2 females, Sugatami, 6. ix. 1967 (SCMH); 11 females, Yukomanbetsu, 8. vi., 22. vi., 8. viii., 21. ix. 1967 (SCMH). [**JAPAN**] [**Honshu**] Aomori Pref.: 2 females and 4 males, Mt. Hakkoda, 21. viii. 1983, 11. ix. 1983, 8. ix. 1984 (M. Yamada, SCMH); 1 female and 6 males, Mt. Iwaki, 29. viii. 1980, 7. ix. 1980, 18. viii. 1981 (M. Yamada, SCMH). Gifu Pref.: 1 female, Nigorigo, 23. viii. 1978 (Y. Morimoto, SCMH). *Other material*: [**JAPAN**] [**Hokkaido**] 1 female, Nishiashoro, 6. viii. 1953 (Y. Hirashima, ELKU); 5 males, Aizankei, Mt. Daisetsu, 30. vii-3. viii. 1955 (Y. Hirashima, ELKU). [**Honshu**] Aomori Pref.: 2 females and 4 males, Mt. Iwaki, 24. vii. 1960, 7. ix. 1980, 21. ix. 1980 (Y. Murakami, ELKU). Akita Pref.: 4 males, Mt. Akitakoma, 28. viii. 1972 (M. Honda, ELKU). Yamagata Pref.: 1 female, Mt. Zao, 21. vi. 1977 (K. Baba, ELKU); 1 male, Mt. Chôkai-san, 27. vii. 1972 (M. Honda, ELKU). Gunma Pref.: 1 female, Kazawa, 17. viii. 1972 (Y. Yoshiyasu, ELKU). Niigata Pref.: 1 female, Mt. Jigami, Mts. Iide, 29. vii. 1985 (N. Kato, ELKU). Nagano Pref.: 5 females, Mt. Komaga-dake, Kiso, 5. vii., 15. vii. 1982 (T. Yumoto, SCMH). Toyama Pref.: 1 female, Tengudaira, Mt. Tate-yama, 21. vii. 1987 (H. Negoro, SCMH). Ishikawa Pref.: 1 female, Mt. Hahu, 4. viii. 1965 (T. Okumura, ELKU). Yamanashi Pref.: 3 females, Mt. Senjohga-dake~Mt. Shirane-kitadake, 28-29. vii. 1959 (Y. Miyatake, ELKU); 1 female, Masutomi, 10. ix. 1975 (J. Emoto, ELKU); 1 female, Kitazawa, Mt. Senjohga-dake, 27. vii. 1959 (Y. Miyatake, ELKU). Gifu Pref.: 2 males, Nigorigo, 23. viii., 9. ix. 1978 (Y. Morimoto, SCMH).

[**RUSSIAN FAR EAST**] 1 female, Primorsky, 70km NW Plastun, 600-800m, Podnebesnyi pass, 18-26. vii. 1996 (A. Plutenko, OLML); 2 females, Shakotan, Sikotan Is., Kurile IsIs., 27. vii. 1940 (S. Kuwayama & Y. Sugihara, ELKU); 1 male, Tosimoe, Etorofu Is., Kurile IsIs., 29-30. viii. 1940 (S. Kuwayama & Y. Sugihara, ELKU).

Lasioglossum (Evylaeus) sibiriacum (Blüthgen, 1923)

(Figs. 47. A-L; 48. A-I; 49. A-E; 57. H; 59. H)

Halictus sibiriacus Blüthgen, 1923, Arch. Naturg., A89 (5): 327-328 [female, eastern Siberia]; Blüthgen, 1924, Konowia, 3 (4/6): 280 [in list, female]; Hirashima, 1957, Sci. Bull. Fac. Agr., Kyushu Univ., 16 (1): 19.

Halictus solovieffi Cockerell, 1925, Proc. U. S. Nat. Mus., 68 (2607): 4 [female, Siberia: Kongaus].

Lasiglossum (Evylaeus) sibiriacum: Ebmer, 1978b, Bonn. zool. Beitr., 29 (1-3): 202; Ebmer, 1995, Linzer biol. Beitr., 27 (2): 571; Ebmer, 1996, Linzer biol. Beitr., 28 (1): 280; Ikudome, 1999, Ident. Guide Aculeata Nansei Is., Jap.: 583-584; Ebmer, 2006, Linzer biol. Beitr., 38 (1): 557-558.

Redescription

Female. Body length 7.1–8.0 mm, wing length 6.2–7.1 mm (n= 5).

Color. Body black except as follows: mandible with apical half reddish brown; tegula brownish semitransparent; posterior margins of metasomal terga broadly yellowish brown semitransparent. Wings nearly transparent; veins and pterostigma yellowish brown; tibial spur yellow.

Pilosity. Body pale yellowish brown to dull whitish. Hairs on head finely branched, moderately dense. Hairs on mesosoma finely branched except as follows: lateral lobe of pronotum and medial area of metanotum with dense tomentose; hind trochanter and femur with plumose hairs, forming scopa. Hairs on anterior and lateral portions of T_1 finely branched, sparse. T_2 with sparse simple and short hairs, and laterally with sparse fine branched hairs. T_{3-4} medially with sparse simple and short hairs, and sometimes posteriorly mixed with moderately dense tomentose. T_5 with dense fine branched hairs over the surface. Basal hair bands present on T_{2-4}, and covering over the basal area of T_{3-4}.

Structure. Head width distinctly longer than head length; head length/width ratio 0.86-0.94 (n= 10). Vertex behind ocelli rugulose. Distance between lateral ocelli as long as the distance between lateral ocellus and compound eye. Frons and paraocular area with cancellate PP (30-40 μø). Supraclypeal area (Figs. 47. C; 48. A) slightly convex in lateral view, dimly shiny, with cancellate PP (30-40 μø), and IS with distinct reticulation. Clypeal length about 1.2 times the distance between lower rim of antennal socket and upper margin of clypeus. Clypeus nearly flat, weakly shiny, with moderately dense

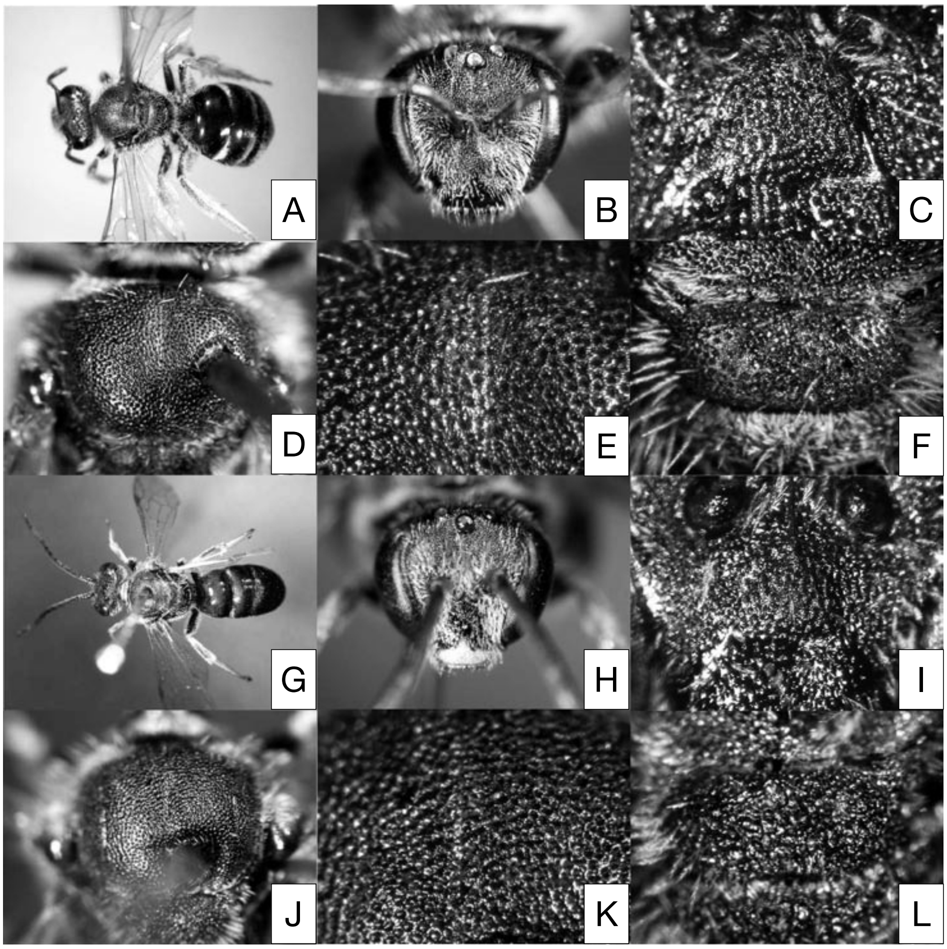

Fig. 47. *Lasioglossum (Evylaeus) sibiriacum* (Blüthgen). A-F: female. G-L: male. A, G: general habitus. B, H: head in frontal view. C, I: supraclypeal area. D, J: mesoscutum. E, K: sculpture of mesoscutum. F, L: mesoscutellum.

larger shallow PP (45-60 μø) and without reticulation over the surface. Basal area of labrum about 2.5 times as wide as long; basal elevation well developed; lateral projection of distal process absent; keel of distal process moderately broad, apically bluntly pointed in frontal view; labral fimbria acutely pointed at apex. Mandible bidentate. Hypostomal carina moderately developed; its anterior angle obtuse. Postgena with reticulation or weak longitudinal striation. Scape length about 1.0 mm (n= 5), F_1 length about 1.1 times or as long as F_2.

Pronotum with dorsolateral angle obtuse; lateral sulcus distinct. Mesoscutum (Fig. 47. D, E) weakly shiny, with cancellate PP (35-50 μø) over the surface; IS anteriorly and medially with distinct reticulation, and posteriorly with weak reticulation or without reticulation. Mesoscutellum (Fig. 47. F) weakly shiny, with cancellate PP (30-40 μø) and IS with distinct reticulation. Metanotum with weak rugulae. Mesepisternum (Fig. 48. C) with coarse rugulae. Metepisternum with transverse ridges on upper half, with rugulae on lower half. Propodeum: the length of propodeal dorsum shorter than that of mesoscutellum, and as long as that of metanotum; propodeal dorsum (Fig. 48. D) with coarse sinuate ridges; transverse carina distinct dorsoapically, and indistinct dorsolaterally; oblique carinae not connected with transverse carina at upper ends; propodeal side coarsely rugulose; shield reticulate. Basitibial plate of hind leg marginally carinate. Inner hind tibial spur (Fig. 48. E) with 3-4 slender teeth (n= 30).

Metasomal terga weakly shiny. T_1 (Fig. 57. H) without striation over the surface, and medially with dense fine PP (≦10 μø). T_2 basally and medially with dense pores, and posteriorly with weak transverse striation. T_{3-4} with moderately dense pores; T_3 posteriorly with weak transverse striation, and T_4 homogeneously striation with T_3 over the surface.

Male. Body length 5.4-7.6 mm, wing length 4.6-6.6 mm (n=5).

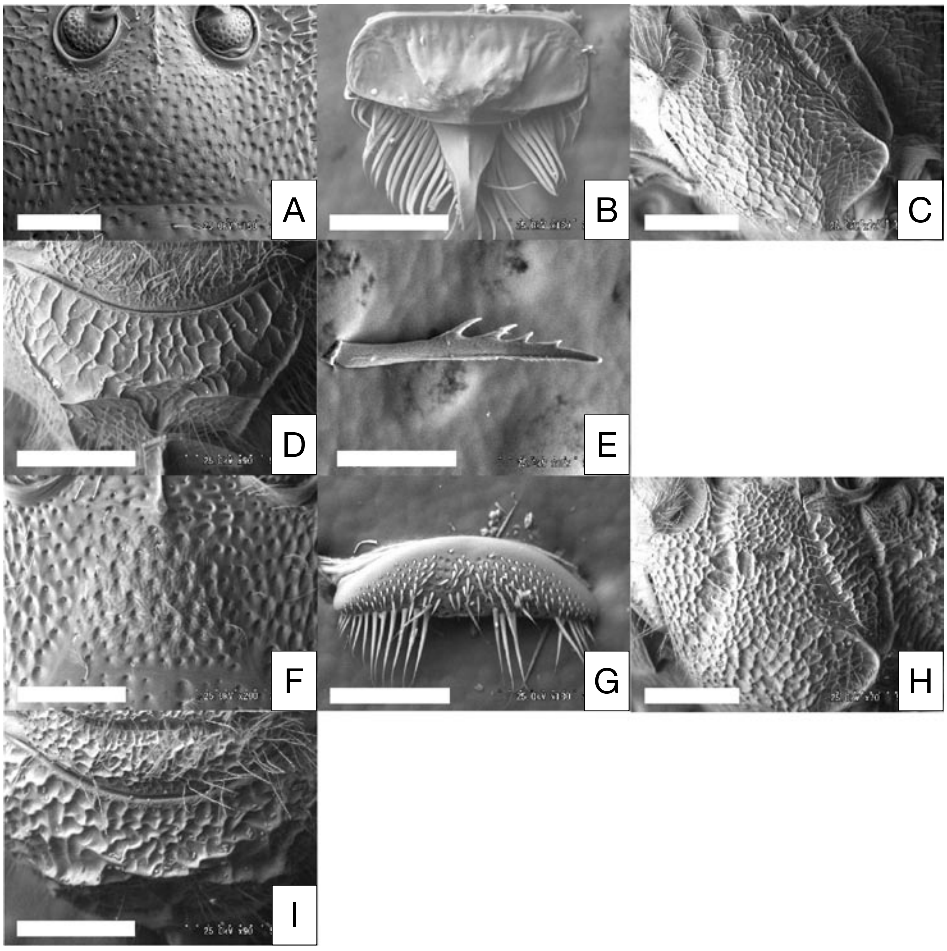

Fig. 48. *Lasioglossum (Evylaeus) sibiriacum* (Blüthgen). A-E: female. F-I: male. A, F: supraclypeal area. B, G: labrum. C, H: mesepisternum. D, I: propodeal dorsum. E: inner hind tibial spur. Scale: C, D, H, I, 0.5mm; B, E, G, 0.25mm; A, F, 0.2mm.

Color. Similar to female except as follows: mandible medially yellow or dark yellow; lower half of clypeus yellow; pronotal lobe yellowish brown; all tibiae basally and apically, and all tarsi yellow.

Pilosity. Similar to female except as follows: lower half of paraocular area, supraclypeal area, and upper half of clypeus with dense tomentose; hairs on metanotum finely branched, sparse; hind trochanter and femur with simple and fine branched hairs, sparse; basal hair bands absent; metasomal terga with sparse short hairs.

Structure. Similar to female except as follows.

Head width distinctly or slightly longer than head length; head length/width ratio 0.94-0.98 (n= 10). Distance between lateral ocelli slightly longer than the distance between lateral ocellus and compound eye. Clypeal length about 1.5 times the distance between lower rim of antennal socket and upper margin of clypeus. Clypeus without reticulation over the surface. Basal area of labrum about 3.3 times as wide as long; basal elevation and distal process absent. Mandible edentate. Scape length 0.4-0.5 mm (n= 5), F_2 length about 2.3 times F_1.

Mesoscutellum (Fig. 47. L) medially depressed, with coarse rugulae. Metanotum with coarse rugulae. Sculptures of propodeum coarser than in female: oblique carinae connected with transverse carina at upper ends. Basitibial plate of hind leg marginally without carina. Inner hind tibial spur without distinct teeth.

T_1 (Fig. 59. H) medially with dense granular PP (20-25 μø). $T_{2\text{-}3}$ basally and medially with dense granular PP (20-25 μø), and the posterior margin with weak transverse striation. T_4 with moderately dense pores, and the posterior margin with weak transverse striation. S_7 with moderately long and broad, apically rounded or truncate median process; S_8 with short, somewhat triangular median process (Fig. 49. E).

Male genitalia (Fig. 49. A-D). Gonobasal ventral arm ring-shaped, and not connected with each other at

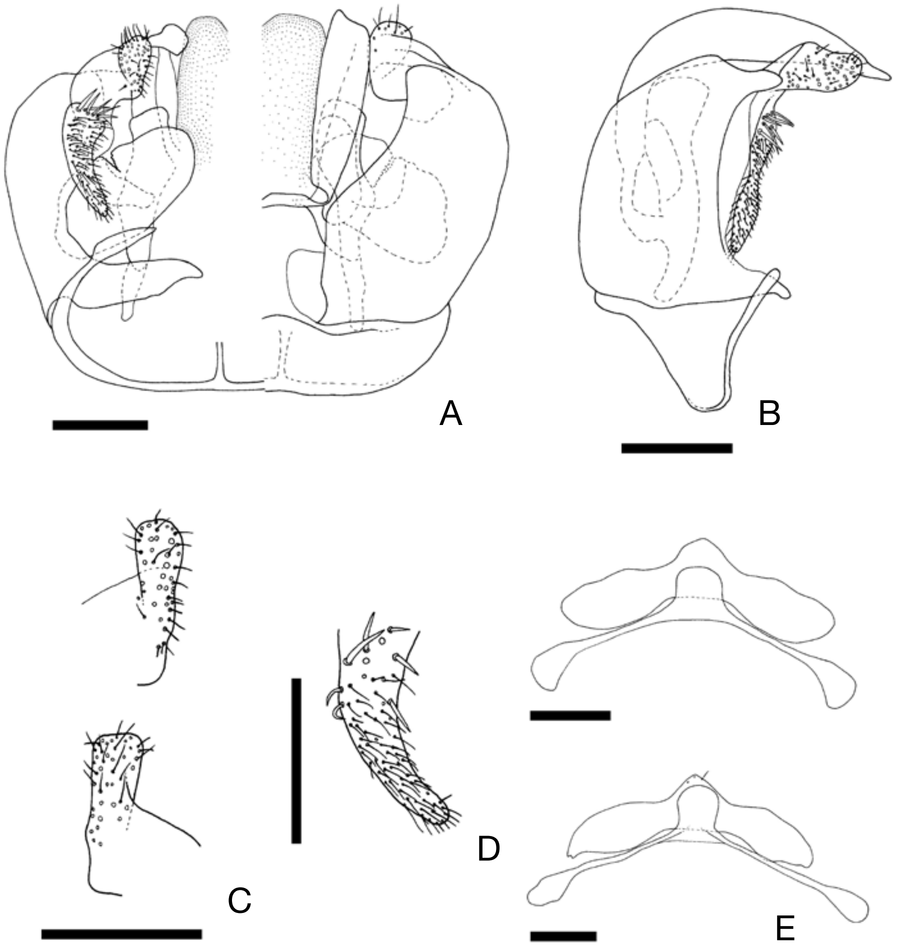

Fig. 49. *Lasioglossum (Evylaeus) sibiriacum* (Blüthgen). A-D: male genitalia. E: S_{7-8}. A: left, ventral view; right, dorsal view. B: lateral view. C: gonostylus (upper, ventral view; lower, dorsal view). D: ventral retrorse lobe. Scale: A-E, 0.2mm.

upper ends in ventral view; the bottom nearly flat. The surface of gonocoxite smooth. Gonostylus (Fig. 49. C) elongate, apically truncate, with sparse pores and short hairs. Ventral retrorse lobe (Fig. 49. D) moderately long, basally with moderately long bristles, medially and posteriorly with moderately dense short hairs.

Remarks. In Japan, this species is relatively similar to *Lasioglossum (Evylaeus) hoffmanni* (Strand), but can be easily separated from it by the luster of mesoscutum duller than in *L. (E.) hoffmanni* in both sexes, the mesoscutum with cancellate PP over the surface in both sexes, the IS of mesoscutum medially with distinct or weak reticulation in both sexes, the T_1 medially with dense PP in both sexes, and the male genitalia with ventral retrorse lobe.

Distribution. Russian Far East (Siberia, Primorsky), China (northeast), Korean Peninsula (north, **south= new record**), Japan [Hokkaido, Honshu, Izu Islands, Shikoku, Kyushu, Tsushima, Ryukyus (Yaku-shima, Tanega-shima)].

Flight records. Female: March to October. Male: June to October.

Biology. Sakagami (1992) reported biology of this species as short comments: it is an eusocial bee, and the nest architecture belongs to pattern IVa of Sakagami, Matsumura & Maeta (1985).

Specimens examined. [**JAPAN**] We have examined 562 females and 41 males from the following localities in Japan: Hokkaido, Aomori, Iwate, Miyagi, Yamagata, Fukushima, Niigata, Tochigi, Saitama, Tokyo, Kanagawa, Yamanashi, Nagano, Fukui, Ishikawa, Gifu, Kyoto, Mie, Wakayama, Hyogo, Tottori, Hiroshima, Yamaguchi, Tokushima, Ehime, Fukuoka, Saga, Nagasaki, Oita, Kumamoto, Miyazaki, Kagoshima Prefectures. Some of the specimens examined are listed as follows: [**Hokkaido**] 9 females and 7 males, Botanical Garden, Sapporo, 22. iv., 30. iv., 6. v., 7. v., 14. vii., 20. vii., 7. ix., 14. ix., 22. ix. 1959 (S. F. Sakagami, SCMH); 2 males, Nishiashoro, 8. viii. 1955 (Y. Hirashima, ELKU). [**Honshu**] Miyagi Pref.: 2 females, Rifu-cho, 13. vii., 2. viii. 1980 (K. Goukon, ELKU). Tokyo: 1 female, Mt. Takao-san, Hachiouji-shi, 17. x. 2003 (R. Murao). Niigata Pref.: 1 male, Mt. Myoken, Sadoga-shima, 16. viii. 1985 (K. Baba, ELKU). Nagano Pref.: 4 females, Ôyanohara, Mt. Shirouma, 15. v. 1976 (O. Tadauchi, ELKU). Fukui Pref.: 1 male, Ôno-shi, 8. ix. 1974 (Y. Haneda, SCMH). Wakayama Pref.: 3 females, Kibi, 6. iv., 24. vii. 1969 (M. Matsumura, SCMH). Hyogo Pref.: 1 female, Mt. Ohya-san, Inagawa-cho, Kawabe-gun, 5. v. 2003 (K. Mitai). Tottori Pref.: 6 females, Masumizu, Mt. Daisen, 26. iv. 1975 (O. Tadauchi, ELKU). Yamaguchi Pref.: 1 female, Koshigahama, Hagi-shi, 17. iv. 2004 (T. Sugimoto). [**Shikoku**] Ehime Pref.: 9 females, Hijikawa-cho, 23. vi. 2004 (R. Murao). Tokushima Pref.: 4 females, Ko-noyadaira, Miwa-gun, 9. vi. 2004 (T. Sugimoto). [**Kyushu**] Fukuoka Pref.: 2 females, Mt. Tachibana-yama, Higashi-ku, Fukuoka-shi, 16. iv. 2003, 31. iii. 2004 (R. Murao). Nagasaki Pref.: 2 females, Asamo, Tsushima, 5. x. 1959 (Y. Hirashima, ELKU). Kumamoto Pref.: 7 females, Aso-machi, Aso-gun, 20. iv., 2. vi., 24. vi. 2001 (A. Yamada & M. Nomura, ALKK); 1 male, Kario, Aso-gun, 18. vi. 1998 (Y. Fujisaki & N. Iwakiri, ALKK). Kagoshima Pref.: 4 females, Sata, Hamajiri-Magome, 30. v. 1952 (T. Esaki & Y. Hirashima, ELKU).

[**NORTH KOREA**] 1 male, Mt. Kongou-san, 7. ix. 1931 (C. Takeya, ELKU). [**SOUTH KOREA**] 1 female, GamJong-ri, Dong-myon, ChunChon-gun, 23. vii. 1992 (K. Kanmiya, ELKU).

Lasioglossum (Evylaeus) subtropicum Sakagami, Miyanaga et Maeta, 1994

(Figs. 50. A-L; 51. A-K; 52. A-E; 57. I; 59. I)

Lasioglossum (Evylaeus) subtropicum Sakagami, Mi-

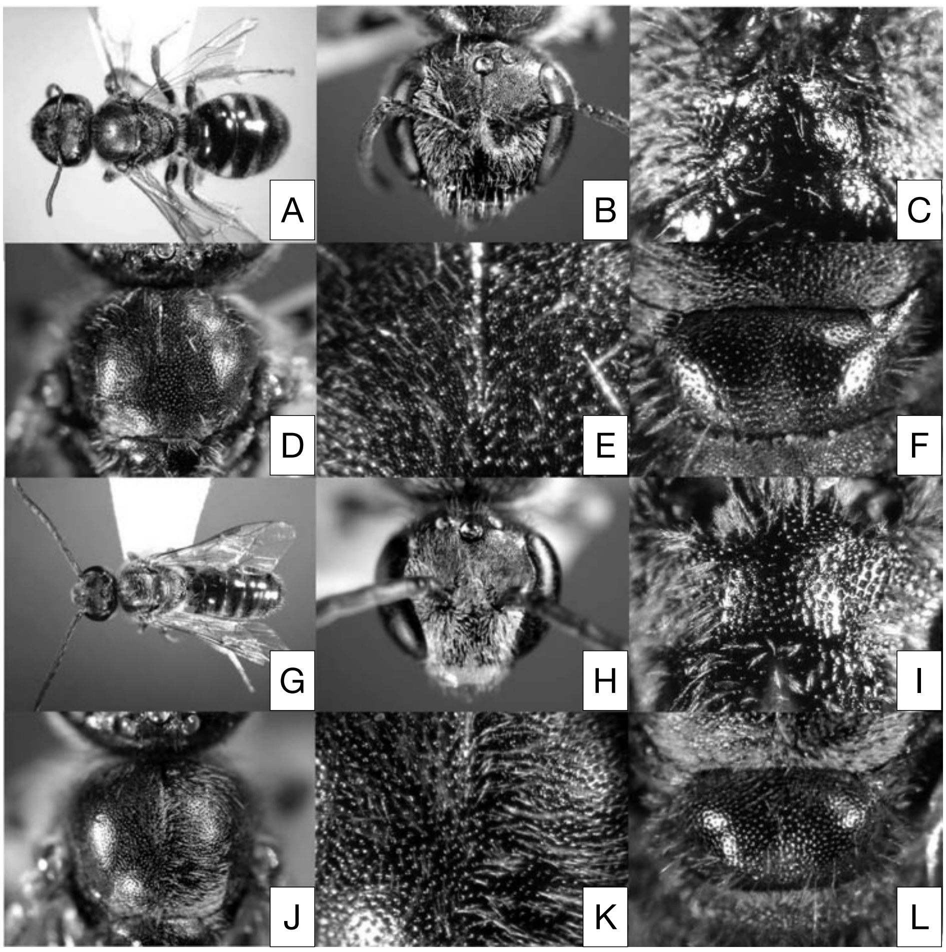

Fig. 50. *Lasioglossum (Evylaeus) subtropicum* Sakagami, Miyanaga et Maeta. A-F: female. G-L: male. A, G: general habitus. B, H: head in frontal view. C, I: supraclypeal area. D, J: mesoscutum. E, K: sculpture of mesoscutum. F, L: mesoscutellum.

yanaga et Maeta, 1994, Bull. Fac. Agr. Shimane Univ., 28: 5-21 [female & male, Japan: Iriomote-jima]; Ebmer, 1995, Linzer biol. Beitr., 27 (2): 572; Tadauchi et al., 1998, Nat. Hist. Bull. Ibaraki Univ., 2: 235-236.

Diagnosis. **Female**: body length, 6.0-7.7mm (n=5); head width distinctly or slightly longer than head length, head length/width ratio 0.83-0.99 (n= 10); supraclypeal area (Figs. 50. C; 51. A) convex, with sparse granular PP (20-25 μø); mesoscutum (Fig. 50. D, E) with dense granular PP (20-30 μø) and IS with distinct reticulation over the surface as in male; mesepisternum (Fig. 51. C) with rugulae as in male; the length of propodeal dorsum slightly shorter than that of mesoscutellum as in male, and about 1.3 times that of metanotum; propodeal dorsum (Fig. 51. D) without transverse carina as in male, and with longitudinal ridges over the surface as in male; inner hind tibial spur (Fig. 51. G) with 2-5 slender teeth (n= 20); T_1 (Fig. 57. I) without striation over the surface as in male, and medially with moderately dense fine PP (≦10 μø). **Male**: body length, 6.4-6.9mm (n=5); head shape variable, head length/width ratio 0.95-1.03 (n= 10); flagellum beneath yellowish brown; F_2 length about 2.4 times F_1; lower half of clypeus yellow; metanotum with very weak rugulae or without rugulae; the length of propodeal dorsum about 1.1 times that of metanotum; all tibiae basally and apically yellow; basitibial plate of hind leg marginally without carina; all tarsi yellow; T_1 (Fig. 59. I) medially with moderately dense granular PP (15-18 μø), and posteriorly with sparse fine PP (≦10 μø).

In female, this species is relatively similar to *Lasioglossum (Evylaeus) baleicum* (Cockerell), but can be easily separated from it by the distal process of labrum, the propodeal dorsum without distinct transverse carina, and the T_1 medially with moderately dense PP. In male,

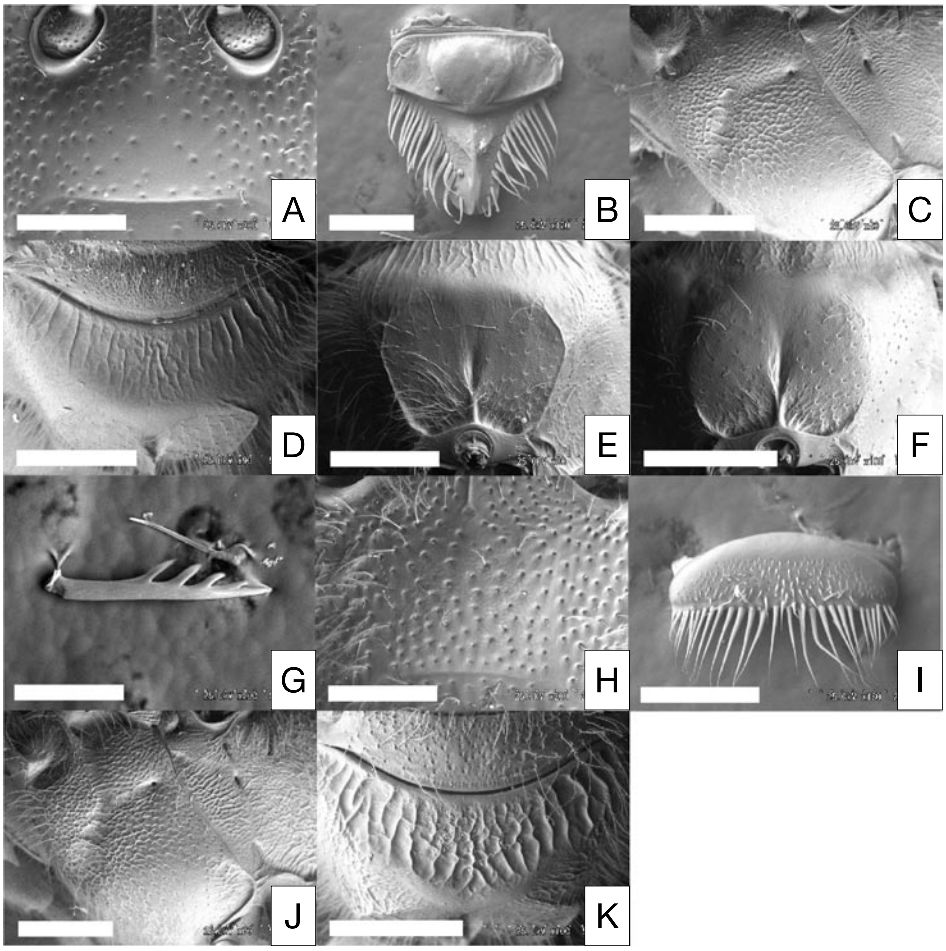

Fig. 51. *Lasioglossum (Evylaeus) subtropicum* Sakagami, Miyanaga et Maeta. A-G: female. H-K: male. A, H: supraclypeal area. B, I: labrum. C, J: mesepisternum. D, K: propodeal dorsum. E, F: shield of propodeum. G: inner hind tibial spur. Scale: C-F, J, K, 0.5mm; B, I, 0.25mm; A, G, H, 0.2mm.

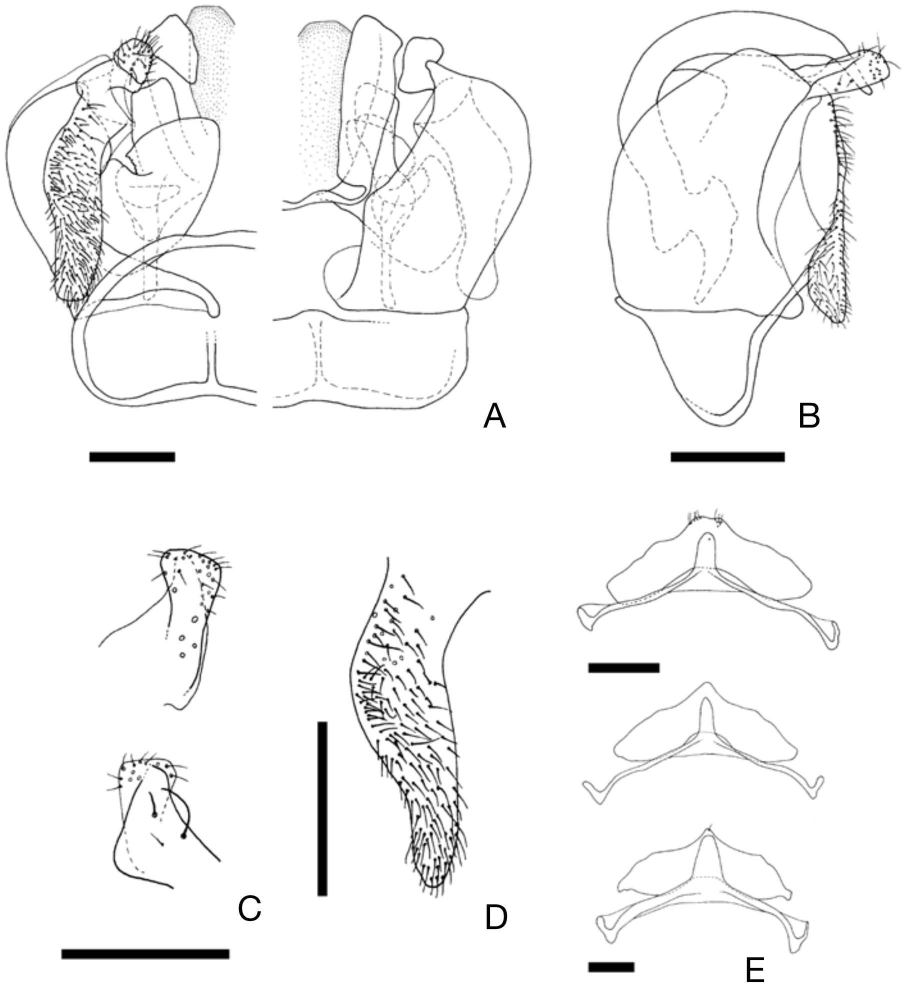

Fig. 52. *Lasioglossum (Evylaeus) subtropicum* Sakagami, Miyanaga et Maeta. A-D: male genitalia. E: S_{7-8}. A: left, ventral view; right, dorsal view. B: lateral view. C: gonostylus (upper, ventral view; lower, dorsal view). D: ventral retrorse lobe. Scale: A-E, 0.2mm.

it is closely similar to *L. (E.) vulsum* (Vachal), but can be separated from it by the metanotum with very weak rugulae or without rugulae.

Supplementary description

Female labrum (Fig. 51. B): basal area about 2.2 times as wide as long; basal elevation well developed; distal process apically rounded; lateral projection of distal process absent; keel of distal process narrow in frontal view; labral fimbria all acutely pointed at apex. Male labrum (Fig. 51. I): basal area about 3 times as wide as long; basal elevation and distal process absent.

Male genitalia (Fig. 52. A-D). Gonobasal ventral arm ring-shaped, and connected with each other at upper ends in ventral view; the bottom nearly flat. The surface of gonocoxite smooth. Gonostylus (Fig. 52. C) elongate, with sparse spots and short hairs. Ventral retrorse lobe (Fig. 52. D) long, with moderately dense short hairs over the surface.

Variation. The median process of S_8 (Fig. 52. E) apically truncate or triangular.

Distribution. Japan (Ryukyus: Ishigaki-jima, Iriomote-jima).

Flight records. Female: March to July. Male: March to July.

Biology. The social structure of this species was described as an eusocial bee by Sakagami *et al*. (1994).

Specimens examined. Holotype: female, Iriomote-jima, Okinawa Pref., Japan, 11-14. iv. 1994 (Y. Maeta, ELKU). Paratypes. [**JAPAN**] [**Ryukyus**] Okinawa Pref.: 14 females, Inaba side of Urauchi-gawa, Iriomote-jima, 5. iv. 1988 (N. Sugiura, SCMH); 2 females, Iriomote-jima, 25-26. iii. 1985 (A. Yoshida, SCMH); 6 females, 11-14. iv. 1994 (Y. Maeta, SCMH). *Other* *material*: [**Ryukyus**] Ishigaki-jima, Okinawa Pref.: 1 female, Uganzaki, 21. iii. 1995 (T. Matsumura, SCMH). Iriomote-jima, Okinawa Pref.: 6 males, 22-23. vi. 1994 (R. Miyanaga, SCMH); 1 male, Funaura, 12. iv. 1994 (SCMH); 1 female, Ôtomi, 22. iii. 1995 (T. Matsumura, SCMH); 1 female, Amitori, 25. iii. 1999 (M. Iwata, ALKK); 8 females, Uehara, 10. iii., 26. iii. 1999 (M. Iwata, ALKK); 3 females and 43 males, Mihara, 10. vii. 2004 (R. Murao); 22 females and 7 males, Funaura, 10. vii. 2004., 15. iii. 2005, 17. iii. 2005 (R. Murao); 3 females, Hoshidate, 15. iii. 2005 (R. Murao); 1 female, Inaba, 10. iii. 1964 (C. M. Yoshimoto & J. Harrel, ELKU); 1 female, Mt. Goza, Ôhara, 23. vi. 1974 (H. Makihara, ELKU); 13 females, Ôtomi, 16. iii. 2005 (R. Murao); 13 females and 458 males, Ôtomi-rindou, 23. v. 2003 (T. Mita), 9. vii. 2004 (R. Murao), 16. iii. 2005 (R. Murao); 17 females, Shirahama-rindou, 15. iii. 2005 (R. Murao); 22 females and 28 males, Sonai, 10. iii. 1964 (T. Shirôzu, ELKU), 10-11. vii. 2004 (R. Murao), 15. iii. 2005 (R. Murao); 1 female, Ushiku-mori, 11. iii. 1964 (Y. Miyatake, ELKU); 3 males, 22-25. vi. 1997 (Y. Maeta, MCDS); 3 males, Nakano, 10-11. vii. 2004 (R. Murao); 1 female, Shirahama, 21. v. 2007 (R. Murao).

Lasioglossum (Evylaeus) vulsum (Vachal, 1903)

(Figs. 53. A-L; 54. A-I; 55. A-E; 57. J; 59. J)

Halictus vulsus Vachal, 1903, Bull. Mus. Hist. Nat. (Paris), 9: 130 [male, Japan].

Lasioglossum (Evylaeus) vulsum: Ebmer et al., 2006, Esakia, (46): 31-33 [synonymy reconfirmed, female & male diagnosis]; Ebmer, 2006, Linzer biol. Beitr., 38 (1): 558.

Halictus trispinis Vachal, 1903, Bull. Mus. Hist. Nat. (Paris), 9: 131 [female, Japan]; Blüthgen, 1926, Deutsch. entomol. Zeitschr., 1926 (4): 349.

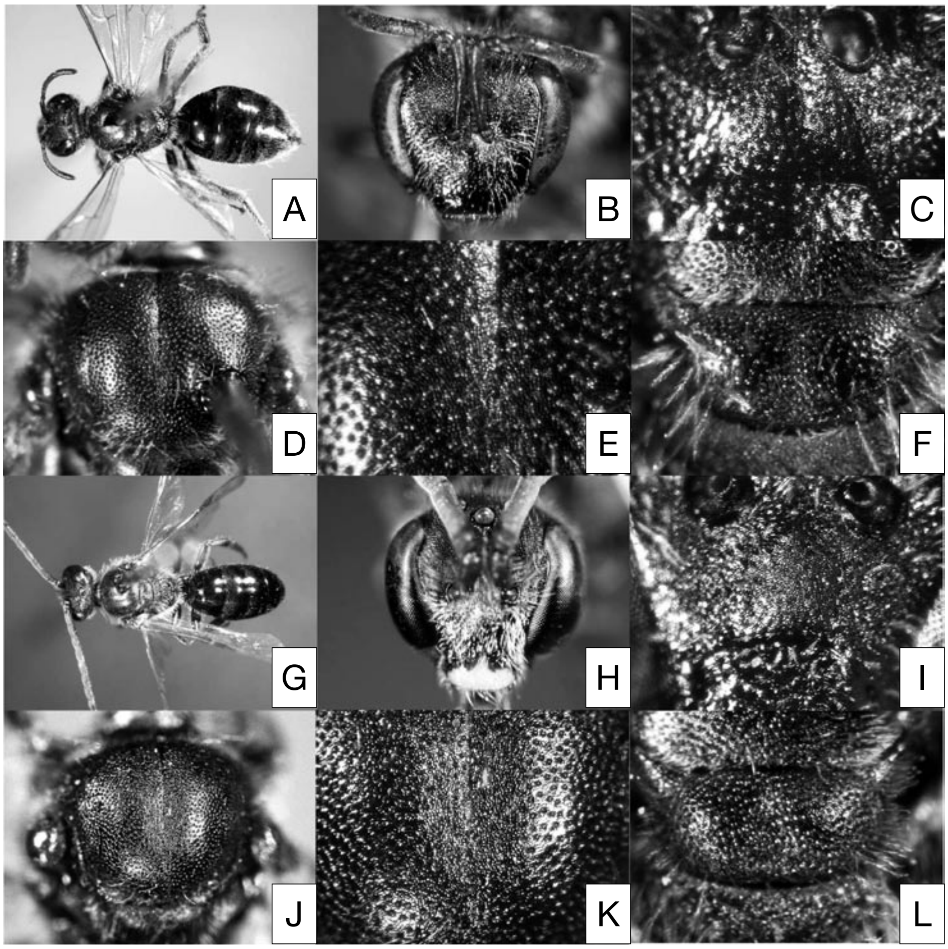

Fig. 53. *Lasioglossum (Evylaeus) vulsum* (Vachal). A-F: female. G-L: male. A, G: general habitus. B, H: head in frontal view. C, I: supraclypeal area. D, J: mesoscutum. E, K: sculpture of mesoscutum. F, L: mesoscutellum.

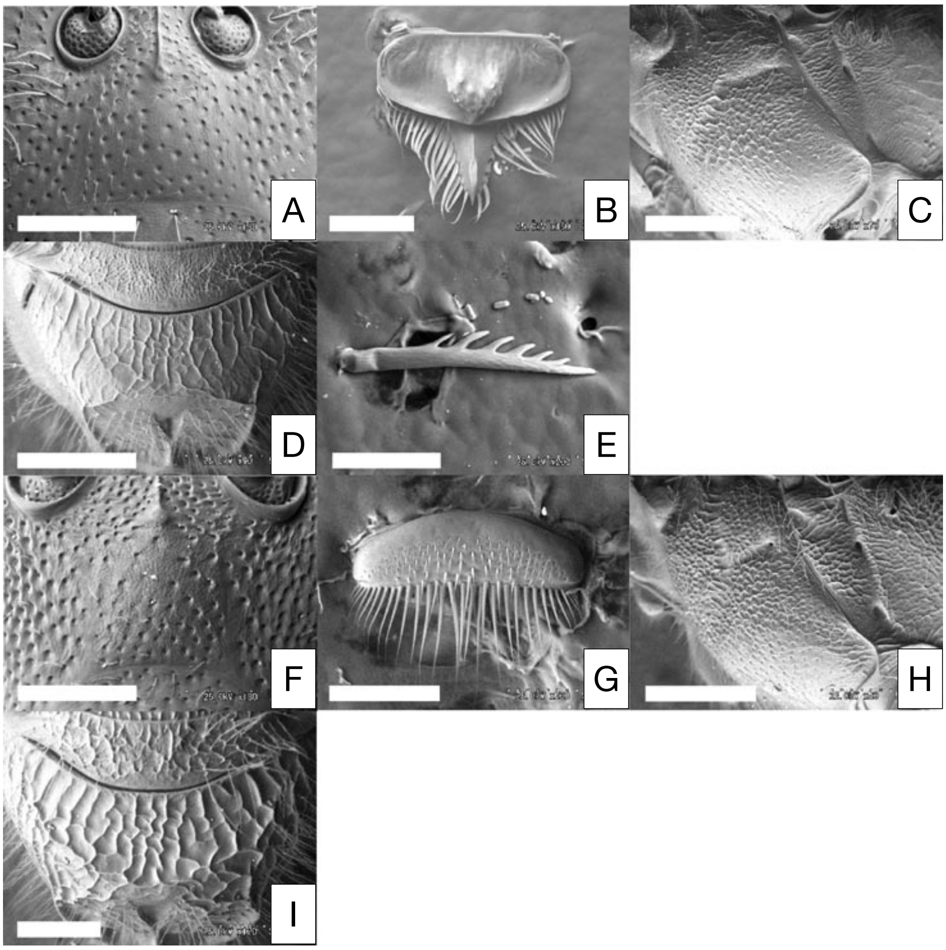

Fig. 54. *Lasioglossum (Evylaeus) vulsum* (Vachal). A-E: female. F-I: male. A, F: supraclypeal area. B, G: labrum. C, H: mesepisternum. D, I: propodeal dorsum. E: inner hind tibial spur. Scale: C, D, H, 0.5mm; A, F, I, 0.25mm; B, E, G, 0.2mm.

Lasioglossum (Evylaeus) trispine: Ebmer, 1995, Linzer biol. Beitr., 27 (2): 571; Ebmer, 1996, Linzer biol. Beitr., 28 (1): 280.

Redescription

Female. Body length 5.9-6.5 mm, wing length 5.4–5.9 mm (n= 5).

Color. Body black except as follows: mandible with apical half reddish brown; flagellum beneath blackish brown; tegula posteriorly and marginally brownish semitransparent; tibial spur yellow; posterior margins of metasomal terga broadly yellowish brown semitransparent. Wings nearly transparent; veins and pterostigma yellowish brown or brown.

Pilosity. Body hairs dull whitish to yellowish brown. Hairs on head finely branched, sparse. Hairs on mesosoma finely branched except as follows: lateral lobe of pronotum and medial area of metanotum with dense tomentose; hind trochanter and femur with plumose hairs, forming scopa. Hairs on anterior and lateral portions of T_1 finely branched, sparse. $T_{2\text{-}4}$ with sparse simple and short hairs on disc, and laterally with sparse fine branched hairs. T_5 with dense fine branched hairs over the surface. Basal hair bands present on $T_{2\text{-}3}$.

Structure. Head width distinctly or slightly longer than head length; head length/width ratio 0.92-0.97 (n= 10). Vertex behind ocelli with transverse ridges. Distance between lateral ocelli about 1.3 times the distance between lateral ocellus and compound eye. Frons and paraocular area dimly shiny, with cancellate PP (20-25 μø). Supraclypeal area (Figs. 53. C; 54. A) slightly convex in lateral view, weakly shiny, with moderately dense granular PP (20 μø); IS with weak reticulation. Clypeal length about 1.2 times the distance between lower rim of antennal socket and upper margin of clypeus. Clypeus flat in lateral view, weakly shiny, with sparse granular PP (30-40 μø) over the surface; IS with weak reticulation on upper half, and without reticulation on lower half. Basal area of labrum about 2.1 times as wide as long; basal elevation well developed; lateral projection of distal process absent; keel of distal process narrow, apically pointed in frontal view; labral fimbria all acutely pointed at apex. Mandible bidentate. Hypostomal carina well developed; its anterior angle obtuse. Postgena with weak reticulation. Scape length about 0.8 mm (n= 5), F_1 length as long as F_2.

Pronotum with dorsolateral angle obtuse; lateral sulcus weak. Mesoscutum (Fig. 53. D, E) weakly shiny, with dense granular PP (20 µø) and IS with distinct reticulation over the surface. Mesoscutellum (Fig. 53. F) weakly shiny, marginally and longitudinally with dense granular PP (20-25 µø); IS with very weak reticulation or without reticulation. Metanotum with weak rugulae or cancellate PP (20 µø). Mesepisternum (Fig. 54. C) coarsely rugulose. Metepisternum with transverse ridges on upper half, with weak rugulae on lower half. Propodeum: the length of propodeal dorsum shorter than that of mesoscutum, and about 1.4 times that of metanotum; propodeal dorsum (Fig. 54. D) with longitudinal ridges, but somewhat dorsomedially with sinuate ridges; transverse carina weak; oblique carinae not connected with transverse carina at upper ends; propodeal side and shield reticulate. Basitibial plate of hind leg marginally carinate. Inner hind tibial spur (Fig. 54. E) with 3-6 slender teeth (n= 30).

Metasomal terga weakly shiny. T_1 (Fig. 57. J) without striation over the surface, and medially with sparse fine PP (≦10 µø). T_2 basally with moderately dense pores, and basally and posteriorly with weak transverse striation, but sometimes posteriorly without striation.

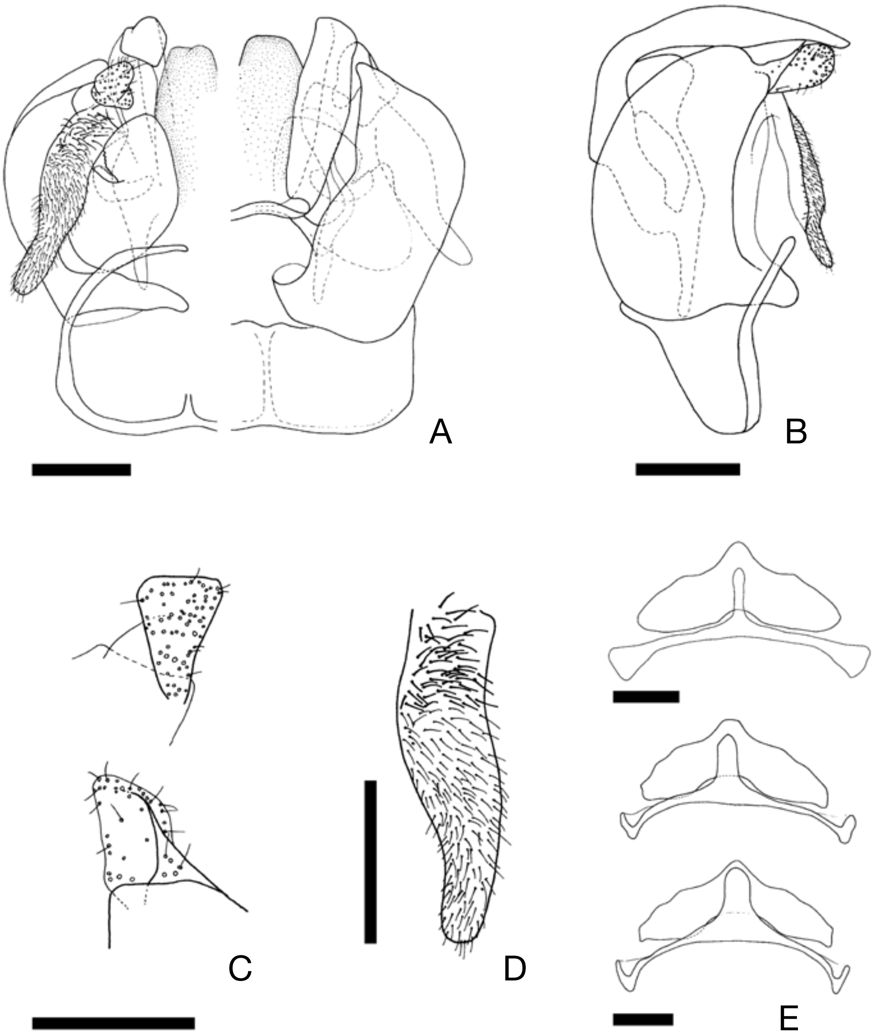

Fig. 55. *Lasioglossum (Evylaeus) vulsum* (Vachal). A-D: male genitalia. E: S_{7-8}. A: left, ventral view; right, dorsal view. B: lateral view. C: gonostylus (upper, ventral view; lower, dorsal view). D: ventral retrorse lobe. Scale: A-E, 0.2mm.

T_{3-4} with moderately dense pores and weak transverse striation over the surface.

Male. Body length 5.8–6.7 mm, wing length 5.4–5.8 mm (n= 5).

Color. Similar to female except as follows: lower half of clypeus yellow; flagellum beneath yellowish brown; pronotal lobe yellowish brown or brown; fore tibia and all tarsi yellow; middle and hind tibiae basally and apically yellow.

Pilosity. Similar to female except as follows: lower half of paraocular area, supraclypeal area, and upper half of clypeus with dense tomentose; hairs on metanotum finely branched, sparse; hind trochanter and femur with simple and finely branched hairs, sparse; metasomal terga with sparse short hairs; basal hair bands absent.

Structure. Similar to female except as follows.

Head length as long as head width, or either head length or width slightly long; head length/width ratio 0.97-1.02 (n= 10). Distance between lateral ocelli about 1.6 times the distance between lateral ocellus and compound eye. IS of supraclypeal area with distinct reticulation. Clypeal length about 1.3 times the distance between lower rim of antennal socket and upper margin of clypeus. Clypeus without reticulation over the surface. Basal area of labrum about 3.1 times as wide as long; basal elevation and distal process absent. Mandible edentate. Scape length 0.3–0.4 mm (n= 5), F_2 length about 2.7 times F_1.

Lateral sulcus of pronotum distinct. IS of mesoscutum anteriorly and medially with distinct reticulation, and posteriorly with weak reticulation. The sculptures of metanotum coarser than in male. Propodeum: the length of propodeal dorsum about 1.7 times that of metanotum; sculptures of propodeum coarser than in female; propodeal dorsum (Fig. 54. I) with irregular sinuate ridges over the surface; propodeal side coarsely rugulose. Basitibial plate of hind leg marginally without carina. Inner hind tibial spur without distinct teeth.

T_1 (Fig. 59. J) medially with moderately dense fine PP (≦10 μø). T_{2-3} basally and medially with dense granular PP (15-20 μø), and basally with very weak transverse striation. S_7 with long and moderately broad or narrow, apically rounded median process; S_8 with short, apically rounded or truncate median process (Fig. 55. E).

Male genitalia (Fig. 55. A-D). Gonobasal ventral arm ring-shaped, and not connected with each other at upper ends in ventral view; the bottom nearly flat. The surface of gonocoxite smooth. Gonostylus (Fig. 55. C) apically truncate, with moderately dense spots and sparse short hairs. Ventral retrorse lobe (Fig. 55. D) long and slender, with dense short hairs.

Variation. See Ebmer *et al.* (2006).

Remarks. This species is closely similar to *Lasioglossum (Evylaeus) baleicum* (Cockerell) and *L. (E.) caliginosum* Murao, Ebmer et Tadauchi, but can be separated from the two allied species by the the clypeus distinctly yellow on lower half in male, the shape of female labrum, the flagellum beneath yellowish brown in male, the mesoscutellum with granular PP in male, the tibiae basally and apically yellow in male, and the gonostylus truncate apically in ventral view. In addition, this species is closely similar to *L. (E.) subtropicum* Sakagami, Miyanaga et Maeta in male, but can be separated from it by the sculptures of metanotum coarser than in *L. (E.) subtropicum.*

Distribution. Russian Far East (Primorsky), China (northeast), Korean Peninsula (north), Japan [Hokkaido, Honshu, Shikoku, Kyushu, Ryukyus (Yaku-shima, Nakano-shima)].

Flight records. Female: March to September. Male: May to early October.

Biology. See Maeta (1966).

Specimens examined. [**Ryukyus**] Nakano-shima, Tokara IsIs., Kagoshima Pref.: 1 female, Mt. Nanatsuyama, 3. vi. 2004 (J. Kantoh); 2 females, Toshima-mura, 21. vi., 25. vi. 1973 (H. Makihara, ELKU). See Ebmer *et al.* (2006) for other specimens examined.

Key to species of the carinate-*Evylaeus* superspecies-group of the subgenus *Evylaeus* in Japan

Female

1. Lateral surface of pronotum with distinct ridge (Figs. 3. C; 25. C) 2
– Lateral surface of pronotum without ridge.............. 3
2. Head length/width ratio 0.93-0.96; vertex behind ocelli with coarse rugulae; frons, paraocular area with coarse cancellate PP; supraclypeal area with uniform PP; length of genal area slightly shorter than that of eye in lateral view; genal area with coarse rugulae; distal process of labrum very broad; dorsolateral angle of pronotum acute; lateral surface of pronotum with an oblique ridge (Fig. 3. C); mesoscutum with uniform PP; metanotum with sparse fine branch hairs; mesepisternum coarsely rugulose; shield of propodeum with sparse fine branch hairs; inner hind tibial spur pectinate; T_1 with distinct or weak striation on disc; [Ryukyus: Amami-ôshima, Okinawa-jima]............ ***L. (E.) latilabrum* Murao et Tadauchi**
– Head length/width ratio 0.8-0.84; vertex behind ocelli somewhat granular; frons, paraocular area

with granular PP; PP of supraclypeal area variable in size (Fig. 25. A); length of genal area longer than that of eye in lateral view; genal area with obscure PP; distal process of labrum slender (Fig. 25. B); dorsolateral angle of pronotum obtuse; lateral surface of pronotum with many ridges (Fig. 25. C); PP of mesoscutum variable in size; metanotum with dense tomentose; mesepisternum with distinct longitudinal ridges in lower area (Fig. 25. D); shield of propodeum with dense tomentose (Fig. 24. G); inner hind tibial spur with small teeth (Fig. 25. F); T1 without striation on disc; [Honshu, Shikoku, Kyushu]..... .... ***L. (E.) percrassiceps*** **(Cockerell)**

3. Distal process of labrum spoon-shaped (Fig. 8. B); inner hind tibial spur with serration (Fig. 8. E) [additional useful character: mesoscutum with sparse PP on medial and posterior areas (Fig. 7. D)].................. .... ***L. (E.) apristum*** **(Vachal)**

– Distal process of labrum slender or moderately broad (e. g., Figs. 10. B; 28. B); inner hind tibial spur with slender or small teeth (e. g. Figs. 10. E; 28. E) 4

4. Length of propodeal dorsum as long as that of metanotum 5

– Length of propodeal dorsum about 1.2-2 times that of metanotum 8

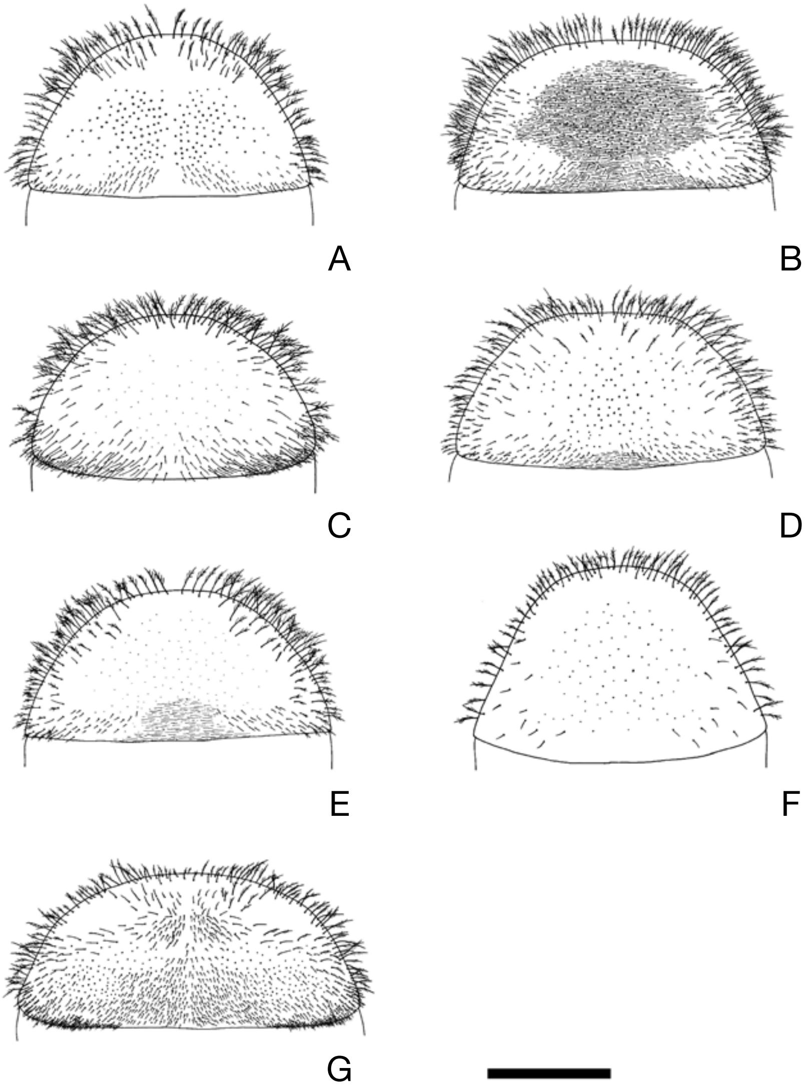

Fig. 56. 1st metasomal tergum of female. A: *Lasioglossum (Evylaeus) apristum* (Vachal). B: *L. (E.) affine* (Smith). C: *L. (E.) albipes* (Fabricius). D: *L. (E.) calceatum* (Scopoli). E: *L. (E.) duplex* (Dalla Torre). F: *L. (E.) nipponense* (Hirashima). G: *L. (E.) percrassiceps* (Cockerell). Scale: 1mm.

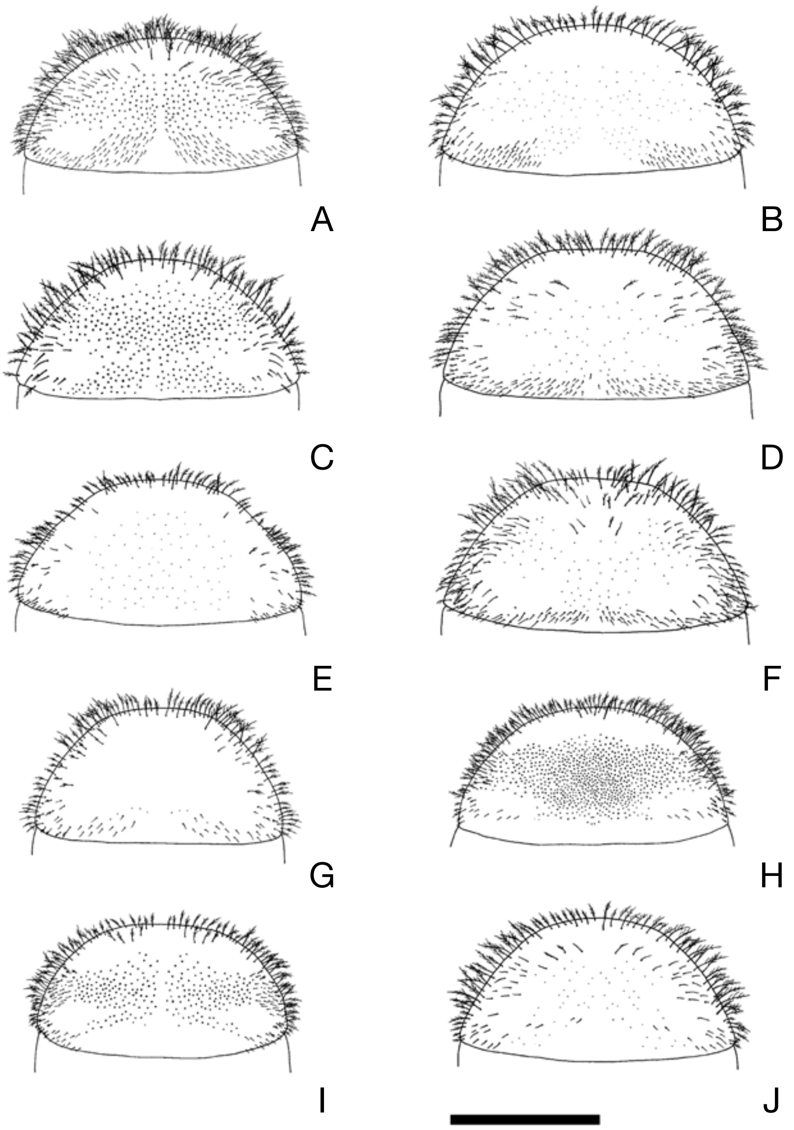

Fig. 57. 1st metasomal tergum of female. A: *Lasioglossum (Evylaeus) hoffmanni* (Strand). B: *L. (E.) naitoi* Ebmer et Maeta. C: *L. (E.) solisortus* Ebmer et Maeta. D: *L. (E.) baleicum* (Cockerell). E: *L. (E.) boreale* Svensson, Ebmer et Sakagami. F: *L. (E.) caliginosum* Murao, Ebmer et Tadauchi. G: *L. (E.) nupricola* Sakagami. H: *L. (E.) sibiriacum* (Blüthgen). I: *L. (E.) subtropicum* Sakagami, Miyanaga et Maeta. J: *L. (E.) vulsum* (Vachal). Scale: 1mm.

5. Mesoscutum medially and posteriorly with sparse PP (Fig. 30. D); T_1 with sparse PP on disc (Fig. 57. B) [Ryukyus: Amami-ôshima, Okinawa-jima, Aka-jima, Iriomote-jima] .... ***L. (E.) naitoi*** **Ebmer et Maeta**
– Mesoscutum medially and posteriorly with dense or moderately dense PP; T_1 with dense or moderately dense PP on disc.. 6
6. Metanotum with distinct reticulation; [Ryukyus: Ishigaki-jima, Iriomote-jima] [additional useful characters: mesoscutum and mesoscutellum dimly shiny, and those of IS with distinct reticulation (Fig. 33. D-F)] ....***L. (E.) solisortus*** **Ebmer et Maeta**
– Metanotum with coarse rugulae; [Hokkaido, Honshu, Shikoku, Kyushu, Ryukyus: Yaku-shima, Tanega-shima]... 7
7. Mesoscutum with cancellate PP over the surface (Fig. 47. D, E); IS of mesoscutum medially and mesoscutellum with distinct reticulation; T_1 with dense PP on disc (Fig. 57. H).........***L. (E.) sibiriacum*** **(Blüthgen)**
– Mesoscutum medially and posteriorly with granular PP (Fig. 27. D, E); IS of mesoscutum medially and

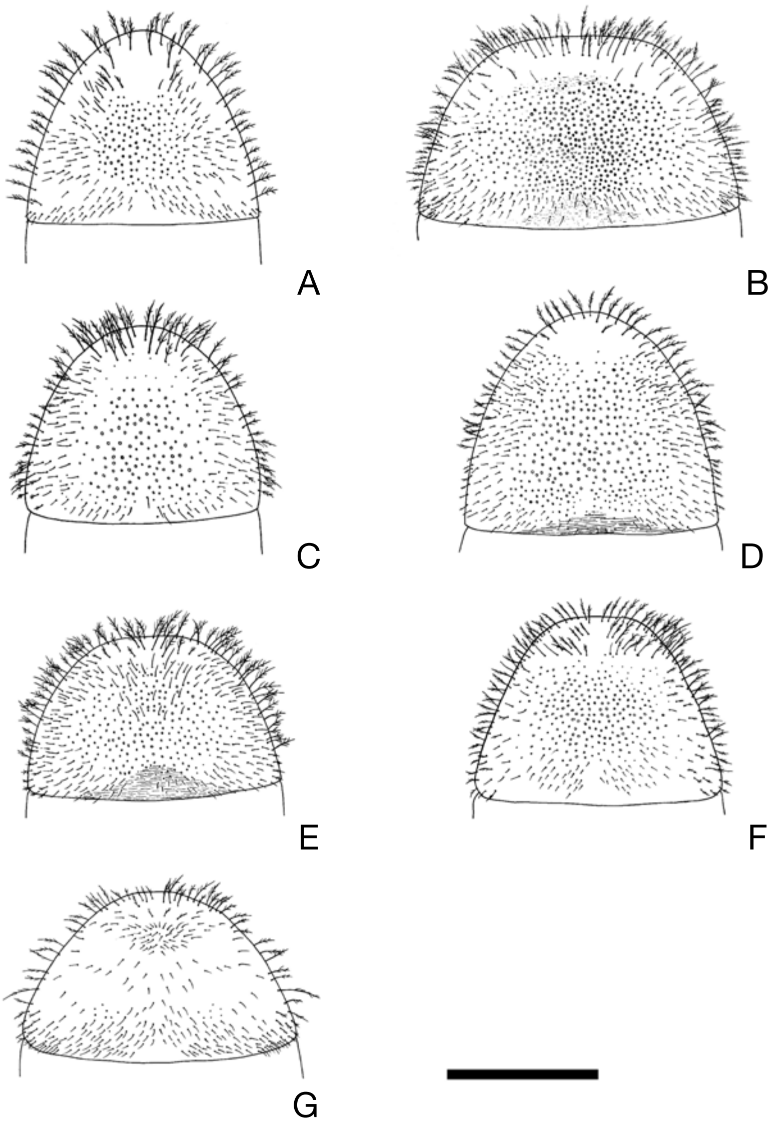

Fig. 58. 1st metasomal tergum of male. A: *Lasioglossum (Evylaeus) apristum* (Vachal). B: *L. (E.) affine* (Smith). C: *L. (E.) albipes* (Fabricius). D: *L. (E.) calceatum* (Scopoli). E: *L. (E.) duplex* (Dalla Torre). F: *L. (E.) nipponense* (Hirashima). G: *L. (E.) percrassiceps* (Cockerell). Scale: 1mm.

mesoscutellum without reticulation; PP on disc of T_1 sparser than in *L. sibiriacum* (Fig. 57. A) ....***L. (E.) hoffmanni* (Strand)**

8. Inner hind tibial spur with small teeth (e. g. Fig. 10. E) 9
– Inner hind tibial spur with slender teeth (e. g., Fig. 37. E).. 13
9. Distance between vertex and posterior ocelli long (about 0.23-0.3mm); T_1 with dense PP and distinct striation on disc (Fig. 56. B)....***L. (E.) affine* (Smith)**
– Distance between vertex and posterior ocelli shorter than in *L. affine* (about 0.1-0.2mm); T_1 with sparse PP (sometimes obscure PP) and without distinct striation on medial area of disc.............................. 10
10. Mesoscutum medially and posteriorly with sparse or moderately dense PP (Fig. 21. D) [additional useful character: head length distinctly longer than width, head length/width ratio 1.07-1.09] .... ***L. (E.) nipponense* (Hirashima)**
– Mesoscutum medially and posteriorly with dense PP 11
11. Supraclypeal area, clypeus and mesoscutum dimly shiny (Fig. 18. C-E); IS of mesoscutum medially and posteriorly with distinct or weak reticulation............ ....***L. (E.) duplex* (Dalla Torre)**
– Supraclypeal area, clypeus and mesoscutum moder-

ately or weakly shiny (Fig. 15. C-E); IS of mesoscutum medially and posteriorly without reticulation.... 12

12. Metasomal terga moderately shiny, rather enamel-like luster.......................***L. (E.) calceatum* (Scopoli)**

– Metasomal terga with distinct oily-dull luster ....***L. (E.) albipes* (Fabricius)**

13. Head length distinctly longer than head width, head length/width ratio 1.05-1.09; mesoscutum dimly shiny (Fig. 44. D, E).....***L. (E.) nupricola* Sakagami**

– Head length shorter than or as long as head width, head length/width ratio 0.83-1.0; mesoscutum moderately or weakly shiny...14

14. Oblique carina of propodeum indistinct or very weakly developed (e.g., Fig. 40. E, F).................... 15

– Oblique carina of propodeum well developed (Fig. 6. A)...16

15. Supraclypeal area with sparse PP (Figs. 50. C; 51. A); IS of supraclypeal area without reticulation; T_1 with distinct moderately dense PP on disc (Fig. 57. I);

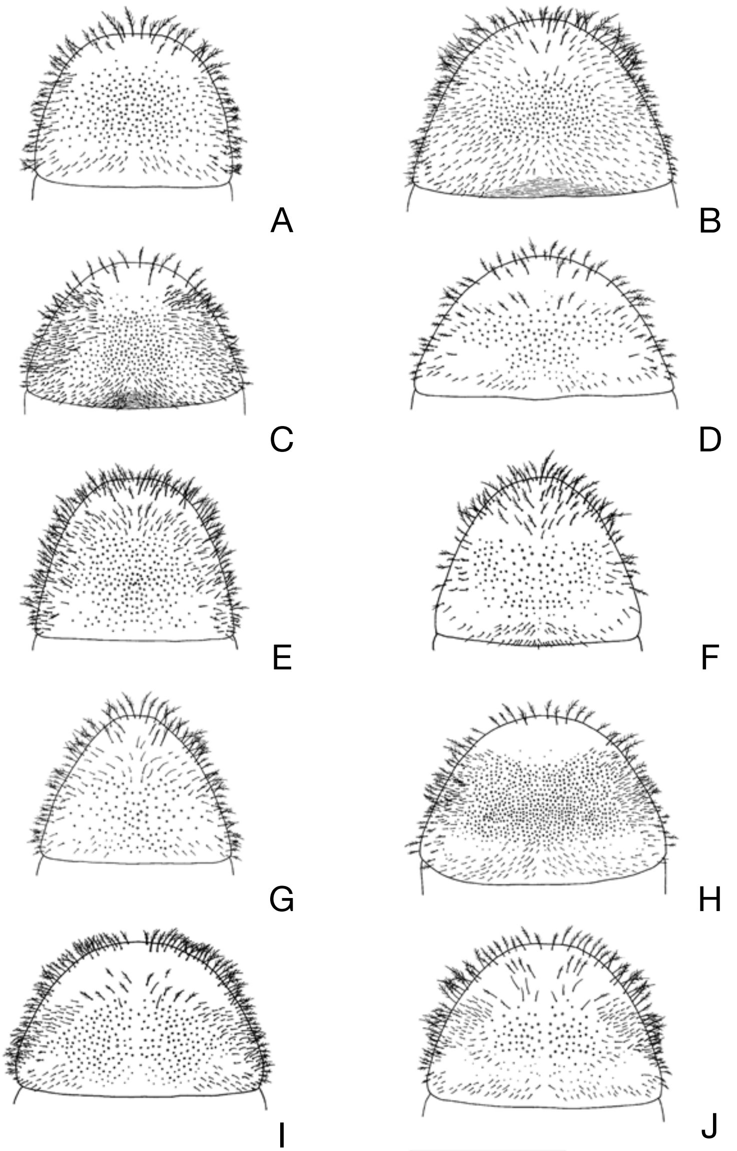

Fig. 59. 1st metasomal tergum of male. A: *Lasioglossum (Evylaeus) hoffmanni* (Strand). B: *L. (E.) naitoi* Ebmer et Maeta. C: *L. (E.) solisortus* Ebmer et Maeta. D: *L. (E.) baleicum* (Cockerell). E: *L. (E.) boreale* Svensson, Ebmer et Sakagami. F: *L. (E.) caliginosum* Murao, Ebmer et Tadauchi. G: *L. (E.) nupricola* Sakagami. H: *L. (E.) sibiriacum* (Blüthgen). I: *L. (E.) subtropicum* Sakagami, Miyanaga et Maeta. J: *L. (E.) vulsum* (Vachal). Scale: 1mm.

[Ryukyus: Ishigaki-jima, Iriomote-jima] ....
.........**_L. (E.) subtropicum_ Sakagami, Miyanaga et Maeta**

– PP of supraclypeal area denser than in *L. subtropicum* (Figs. 39. C; 40. A); IS of supraclypeal area with distinct or weak reticulation; T_1 with sparse PP on disc (rather obscure PP) (Fig. 57. E); [Hokkaido: high mountain areas]..
.......**_L. (E.) boreale_ Svensson, Ebmer et Sakagami**

16. Distance between vertex and posterior ocelli long (about 0.1-0.14 mm) [additional useful character: supraclypeal area usually with sparse PP (Figs. 36. C; 37. A), but sometimes with moderately dense PP].....
....................................**_L. (E.) baleicum_ (Cockerell)**

– Distance between vertex and posterior ocelli shorter than *L. baleicum* (about 0.03-0.07 mm).................17

17. Supraclypeal area with moderately dense PP (Figs. 53. C; 54. A); basal elevation of labrum narrower than in *L. caliginosum* (Fig. 54. B); distal process of labrum as in Fig. 54. B....... **_L. (E.) vulsum_ (Vachal)**

– Supraclypeal area usually with sparse PP (Figs. 42. C; 43. A), but sometimes with moderately dense PP; basal elevation of labrum broader than in *L. vulsum* (Fig. 43. B); distal process of labrum as in Fig. 43. B
....**_L. (E.) caliginosum_ Murao, Ebmer et Tadauchi**

Male

1. Lateral surface of pronotum with distinct many ridges (Fig. 25. I); shield of propodeum with moderately dense tomentose (Fig. 24. N); basitibial plate of hind leg marginally carinate (Fig. 25. L); S_5 laterally with moderately long hair tufts (Fig. 24. O); apical margin of S_5 distinctly concave on medial area in frontal view (Fig. 25. M) [additional useful character: F_1 length as long as F_2] .... **_L. (E.) percrassiceps_ (Cockerell)**

– Lateral surface of pronotum without ridges; shield of propodeum with sparse fine branch hairs; basitibial plate of hind leg marginally without carina; S_5 laterally without hair tufts; apical margin of S_5 nearly flat on medial area in frontal view................................. 2

2. Clypeus slightly dark yellow on lower margin or entirely black over the surface (e.g., Fig. 36. H).......... 3

– Clypeus distinctly yellow on lower half (e. g., Fig. 7. K)... 4

3. Mesoscutellum with cancellate PP or weak rugulae (Fig. 42. L); gonostylus ovate in ventral view; ventral retrorse lobe broad ....
....**_L. (E.) caliginosum_ Murao, Ebmer et Tadauchi**

– Mesoscutellum with coarse rugulae (Fig. 36. L); gonostylus rounded in ventral view (Fig. 38. C); ventral retrorse lobe slender (Fig. 38. D)........................
....................................**_L. (E.) baleicum_ (Cockerell)**

4. Flagellum beneath distinctly yellow or yellowish brown 5

– Flagellum beneath blackish brown or brown 9

5. Head length distinctly longer than head width, head length/width ratio 1.07-1.18..................................... 6

– Head length as long as head width, or either length or width slightly long, head length/width ratio 0.95-1.03 8

6. Labrum yellow; tibiae basally and apically distinctly yellow; tarsi yellow [additional useful character: ventral retrorse lobe short (Fig. 41. A, D)]................
.......**_L. (E.) boreale_ Svensson, Ebmer et Sakagami**

– Labrum black or blackish brown; tibiae and tarsi black or blackish brown 7

7. Mesoscutum and mesoscutellum dimly shiny (Fig. 44. J-L); IS of mesoscutum with distinct reticulation over the surface; mesoscutellum with cancellate PP or weak rugulae (Fig. 44. L); male genitalia with ventral retrorse lobe ....
.....................................**_L. (E.) nupricola_ Sakagami**

– Mesoscutum and mesoscutellum moderately shiny (Fig. 21. J-L); IS of mesoscutum without reticulation on medial and posterior areas; mesoscutellum with granular PP (Fig. 21. L); male genitalia without ventral retrorse lobe ....
................**_L. (E.) nipponense_ (Hirashima), in part**

8. Metanotum with very weak rugulae or without rugulae; PP of T_1 denser than in *L. vulsum* (Fig. 59. I); [Ryukyus: Ishigaki-jima, Iriomote-jima] ....
...**_L. (E.) subtropicum_ Sakagami, Miyanaga et Maeta**

– Metanotum with coarse rugulae; PP of T_1 sparser than in *L. subtropicum* (Fig. 59. J); [Hokkaido, Honshu, Shikoku, Kyushu, Ryukyus: Yaku-shima, Nakano-shima].................. **_L. (E.) vulsum_ (Vachal)**

9. Tarsi black or blackish brown [additional useful character: head length distinctly longer than width, head length/width ratio 1.13-1.18].............................
................**_L. (E.) nipponense_ (Hirashima), in part**

– Tarsi yellow or yellowish brown............................ 10

10. F_2 length as long as or about 1.2 times F_1 ....
....**_L. (E.) affine_ (Smith)**

– F_2 length about 1.8-2.3 times F_1 11

11. Head length distinctly longer than head width, head length/width ratio 1.05-1.16 12

– Head length as long as or distinctly shorter than head width, head length/width ratio 0.94-1.0 14

12. Metasomal terga pale reddish in parts (Fig. 12. G)...
.... **_L. (E.) albipes_ (Fabricius)**

– Metasomal terga entirely black............................. 13

Table 1. Distribtuion of the carinate-*Evylaeus* species in Japan. IzI: Izu Islands. Ts: Tsushima. OsI: Osumi Islands. ToI: Tokara Islands. AmI: Amami Islands. OkI: Okinawa Islands. SaI: Sakishima Islands.

species	**Hokkaido**	**Honshu**	**IzI**	**Shikoku**	**Ts**	**Kyushu**	**Ryukyus**				
							OsI	ToI	AmI	OkI	SaI
affine	○	○		○	○	○	○				
albipes	○	○									
apristum	○	○		○	○	○	○				
baleicum	○	○		○		○	○				
boreale	○										
calceatum	○										
caliginosum	○	○		○		○					
duplex	○	○	○	○	○	○					
hoffmanni	○	○		○	○	○					
latilabrum									○	○	
naitoi									○	○	○
nipponense	○	○		○		○					
nupricola	○	○									
percrassiceps		○		○		○					
sibiriacum	○	○	○	○	○	○	○				
solisortus											○
subtropicum											○
vulsum	○	○		○		○	○	○			
number of species	13	12	2	10	5	10	5	1	2	2	3

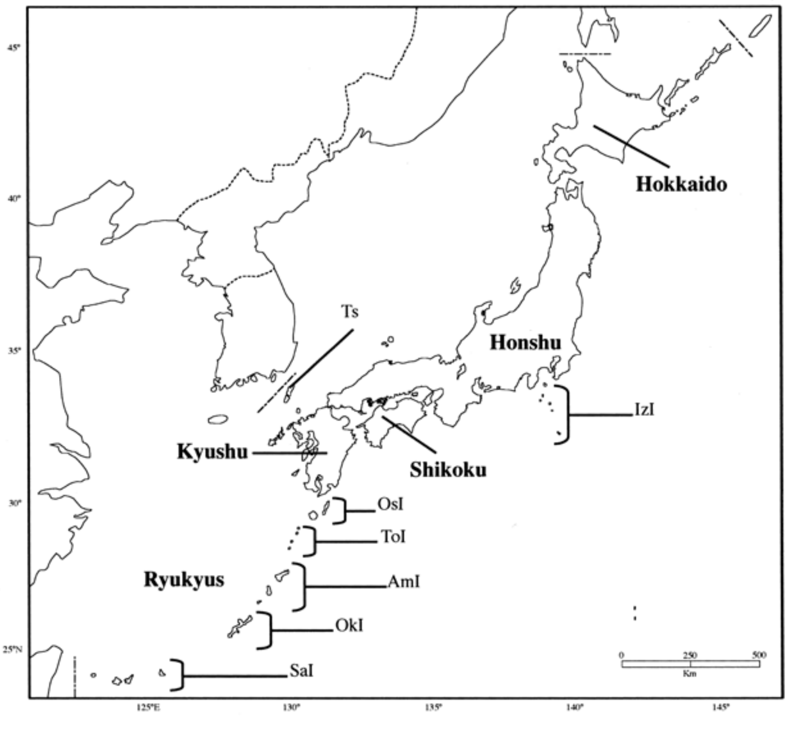

Fig. 60. A map of Japanese Islands (abbreviations corresponding to the Table 1.).

Table 2. Summary of flower records for the carinate-*Evylaeus* species. The numerous indicate the number of plant genera, and those in the parenthesis indicate the number of plant species visited by carinate-*Evylaeus* species, respectively.

Plant Family	carinate-*Evylaeus* spp.								
	affine	*albipes*	*apristum*	*baleicum*	*boreale*	*calceatum*	*caliginosum*	*duplex*	*hoffmanni*
Acanthaceae	1(1)								1(1)
Aceraceae			1(1)	1(1)					
Amaranthaceae	1(1)		1(1)						
Anacardiaceae				1(1)					1(1)
Apiaceae			2(2)	3(3)			3(3)	1(1)	
Aquifoliaceae			1(1)					1(1)	
Araliaceae			1(2)						1(1)
Asteraceae	28(46)	8(9)	13(17)	11(15)	2(2)	9(12)	9(13)	10(15)	8(8)
Berberidaceae							1(1)	1(1)	
Brassicaceae	4(5)		2(3)	2(2)			4(4)	2(4)	4(7)
Buxaceae				1(1)				1(1)	
Campanulaceae								1(1)	
Caprifoliaceae	1(1)		3(6)			1(1)	1(1)	1(1)	
Caryophyllaceae				1(1)					2(3)
Celastraceae			1(1)						
Clethraceae			1(1)						
Clusiaceae									1(1)
Commelinaceae	1(1)							1(1)	
Convolvulaceae	1(1)			1(1)					
Cucurbitaceae	1(1)								
Ericaceae			2(2)	2(3)	1(1)				1(2)
Euphorbiaceae									1(1)
Fabaceae	3(4)		4(5)	2(2)			1(1)	1(1)	2(2)
Fagaceae								1(1)	1(1)
Fumariaceae			1(1)	1(1)					
Geraniaceae	1(2)	1(1)	1(1)	1(2)		1(1)	1(1)		
Hydrangeaceae	1(1)		3(9)	2(3)			1(1)		2(2)
Iridaceae	1(1)								
Lamiaceae	3(3)		2(2)	2(2)					2(2)
Liliaceae	1(2)						1(1)	4(5)	1(1)
Lythraceae	1(1)								
Melastomataceae			1(1)						
Oleaceae	1(1)							1(1)	1(1)
Onagraceae	1(1)				1(1)		1(1)		
Oxalidaceae	1(1)								1(1)
Papaveraceae			1(1)				1(1)		
Polygonaceae	2(3)		2(4)	2(4)			1(2)	1(1)	1(2)
Portulacaceae	1(1)								
Primulaceae	1(1)						1(1)	1(1)	
Ranunculaceae	1(3)		1(1)				1(1)	1(1)	1(2)
Rosaceae	2(2)	1(1)	6(8)	6(8)			4(5)	2(2)	5(7)
Rubiaceae	1(1)		1(1)						
Rutaceae	1(1)		2(3)						1(1)
Salicaceae				1(4)			1(2)		
Saxifragaceae			1(1)	1(1)					
Scrophulariaceae	1(1)			1(1)				2(2)	2(3)
Solanaceae	1(1)								
Staphyleaceae			1(2)				1(1)		
Styracaceae	1(1)								
Symplocaceae			1(1)						
Theaceae								1(1)	
Valerianaceae	1(1)		1(1)						
Verbenaceae								1(1)	
Vitaceae			1(1)						
Totals	65(90)	10(11)	58(80)	42(56)	4(4)	11(14)	33(40)	35(43)	40(50)

Table 3. Summary of flower records for the carinate-*Evylaeus* species. The numerous indicate the number of plant genera, and those in the parenthesis indicate the number of plant species visited by carinate-*Evylaeus* species, respectively.

Plant Family	carinate-*Evylaeus* spp.								
	latilabrum	*naitoi*	*nipponense*	*nupricola*	*percrassiceps*	*sibiriacum*	*solisortus*	*subtropicum*	*vulsum*
Acanthaceae									1(1)
Aceraceae						1(2)			
Amaranthaceae						1(1)			
Anacardiaceae							1(1)	1(1)	2(2)
Apiaceae		1(1)				3(3)	1(1)	1(1)	2(2)
Aquifoliaceae									
Araliaceae									1(1)
Asteraceae		1(1)	7(8)	9(10)	1(1)	12(16)	2(2)	4(4)	13(20)
Berberidaceae						1(1)			
Boraginaceae							1(1)	1(1)	
Brassicaceae				1(1)		4(7)			3(7)
Buxaceae						1(1)			1(1)
Caprifoliaceae			1(2)			2(2)			
Caryophyllaceae						1(2)			1(1)
Celastraceae									1(2)
Cornaceae			1(1)			1(1)			
Crassulaceae		1(1)							
Elaeocarpaceae								1(1)	
Ericaceae						2(3)			1(2)
Euphorbiaceae								1(1)	
Fabaceae						1(1)	1(1)	1(1)	2(2)
Fumariaceae						1(1)			
Geraniaceae									1(1)
Hydrangeaceae						1(4)			2(4)
Lamiaceae						2(2)			1(1)
Liliaceae						2(2)			
Oleaceae						1(1)			
Oxalidaceae							1(1)		1(1)
Papaveraceae						1(1)			1(1)
Polemoniaceae							1(1)		
Polygonaceae						2(3)			2(3)
Primulaceae						1(1)			
Ranunculaceae			1(1)			1(2)			1(1)
Rhamnaceae						1(1)			
Rosaceae			1(1)			7(14)			7(7)
Rutaceae						1(1)			1(1)
Salicaceae						1(1)			1(2)
Saxifragaceae						1(2)			
Scrophulariaceae						1(1)			1(1)
Simaroubaceae						1(1)			
Staphyleaceae							1(1)		
Vitaceae									1(1)
Zigiberaceae							1(1)		
Totals	0	3(3)	11(13)	10(11)	1(1)	55(78)	10(10)	10(10)	48(65)

13. Mesoscutum and mesoscutellum dimly shiny (Fig. 18. J-L); IS of mesoscutum and mesoscutellum with distinct reticulation ..... ***L. (E.) duplex* (Dalla Torre)**

– Mesoscutum and mesoscutellum moderately shiny (Fig. 15. J-L); IS of mesoscutum and mesoscutellum without reticulation or sometimes with very weak reticulation .... ***L. (E.) calceatum* (Scopoli)**

14. Mesoscutum medially and posteriorly with granular PP [additional useful character: IS of mesoscutum without reticulation or with weak reticulation] 15

– Mesoscutum with cancellate PP over the surface (e. g., Figs. 7. N; 47. K) 16

15. Mesoscutellum with coarse rugulae (Fig. 27. L); [Hokkaido, Honshu, Shikoku, Kyushu] ....

......................................***L. (E.) hoffmanni*** **(Strand)**

– Mesoscutellum with granular PP over the surface, or marginally and longitudinally with cancellate PP (Fig. 30. L); [Ryukyus: Amami-ôshima, Okinawa-jima, Iriomote-jima] ....
.... ***L. (E.) naitoi*** **Ebmer et Maeta**

16. Mesoscutum weakly shiny; mesoscutellum with coarse rugulae (Fig. 47. L); male genitalia with ventral retrorse lobe........***L. (E.) sibiriacum*** **(Blüthgen)**

– Mesoscutum dimly shiny; mesoscutellum with cancellate PP or weak rugulae (e.g., Fig. 33. L); male genitalia without ventral retrorse lobe....................17

17. Tibiae basally and apically slightly yellow, sometimes entirely black or brown; inner side of gonocoxites with distinct projection apically in dorsal view; [Hokkaido, Honshu, Shikoku, Kyushu, Ryukyus: Yaku-shima] .... ***L. (E.) apristum*** **(Vachal)**

– Tibiae basally and apically distinctly yellow; gonocoxites apically with long bristles in ventral view (Fig. 35. A); [Ryukyus: Ishigaki-jima, Iriomote-jima]..................***L. (E.) solisortus*** **Ebmer et Maeta**

The records of social structure in carinate-*Evylaeus* superspecies-group

The social structure is recorded for 13 species in Japanese carinate-*Evylaeus* species. In Japan, *Lasioglossum (Evylaeus) duplex* (Dalla Torre) has been well accumulated for the biological information until now. *Lasioglossum (Evylaeus) hoffmanni* (Strand), *L. (E.) nipponense* (Hirashima), *L. (E.) sibiriacum* (Blüthgen) and *L. (E.) subtropicum* Sakagami, Miyanaga et Maeta are described as short comments by Sakagami (1979, 1992) and Sakagami *et al.* (1994). The record of social structure for each species is listed as follows.

L. (E.) affine **(Smith)**. Eusocial (Sakagami *et al.*, 1982).

L. (E.) albipes **(Fabricius)**. Socially polymorphic in the European population (Plateaux-Quénu, 1993), however, the detailed record is absent in the Japanese population.

L. (E.) apristum **(Vachal)**. Socially polymorphic (Miyanaga *et al.*, 1999).

L. (E.) baleicum **(Cockerell)**. Socially polymorphic (Cronin & Hirata, 2003).

L. (E.) boreale **Svensson, Ebmer et Sakagami**. Solitary (Svensson *et al.*, 1977).

L. (E.) calceatum **(Scopoli)**. Socially polymorphic (Sakagami & Munakata, 1972).

L. (E.) duplex **(Dalla Torre)**. Eusocial (e. g., Sakagami & Hayashida, 1968).

L. (E.) hoffmanni **(Stand)**. Eusocial [recorded as *L. (E.) vulsum*] (Sakagami, 1979).

L. (E.) nipponense **(Hirashima)**. Solitary (Sakagami, 1979).

L. (E.) nupricola **Sakagami**. Solitary (Sakagami, 1988).

L. (E.) sibiriacum **(Blüthgen)**. Eusocial (Sakagami, 1979, 1992).

L. (E.) subtropicum **Sakagami, Miyanaga et Maeta**. Eusocial (Sakagami *et al.*, 1994).

L. (E.) vulsum **(Vachal)**. Solitary [recorded as *L.* sp. near *fulvicorne* (Kirby)] (Maeta, 1966).

Flower records in carinate-*Evylaeus* superspecies-group

Flowering plants recorded here contain 294 species belonging to 167 genera in 62 families for Japanese carinate-*Evylaeus* species. The flower records for each species are summarized in Tables 2-3. The Japanese carinate-*Evylaeus* species are evidently polylectic except for *Lasioglossum (Evylaeus) latilabrum* Murao et Tadauchi which has no flower records, and *L. (E.) percrassiceps* (Cockerell) which is only recorded from *Aster iinumae* Kitam., in this study. However, *L. (E.) percrassiceps* may be polylectic because the flight season is long. Table 4 shows plant families, genera and species that visited by 6 or more carinate-*Evylaeus* species. The Japanese carinate-*Evylaeus* species were most attracted by Asteraceae (visited by 17 spp.) at family-level, *Taraxacum* (visited by 12 spp.) at genus-level, and four species [*Brassica rapa* L. var. *oleifera* DC.; *Picris hieracioides* L. subsp. *japonica* (Thunb.) Krylov.; *Taraxacum officinale* Weber ex F. H. Wigg.; *T. platycarpum* Dahlst., visited by 8 spp., respectively] at species-level.

Checklist in carinate-*Evylaeus* superspecies-group

apristum species-group

1. *Lasioglossum (Evylaeus) apristum* (Vachal, 1903)

Type locality: Japan.
Type depository: Muséum National d'Histoire Naturelle, Paris, France (lectotype).
Sex of the type: Female.
Japanese name: Nijiiro-ko-hanabachi.

calceatum species-group

2. *Lasioglossum (Evylaeus) affine* (Smith, 1853)

Type locality: China.
Type depository: BMNH.

Table 4. Plant families, genera, and species that visited by 6 or more carinate-*Evylaeus* species.

Plant Family	No. of *Evylaeus* spp.
Asteraceae	17
Fabaceae	10
Rosaceae	10
Brassicaceae	9
Apiaceae	8
Polygonoceae	8
Ranunculaceae	8
Caprifoliaceae	7
Geraniaceae	7
Hydrangeaceae	7
Ericaceae	6
Lamiaceae	6
Scrophulariaceae	6

Plant Genus	No. of *Evylaeus* spp.
Taraxacum	12
Aster	11
Solidago	9
Brassica	8
Erigeron	8
Ixeris	8
Picris	8
Anaphalis	7
Geranium	7
Petasites	7
Capsella	6
Fallopia	6
Hydrangea	6
Persicaria	6
Potentilla	6
Ranunculus	6
Rosa	6
Senecio	6

Plant Species	No. of *Evylaeus* spp.
Brassica rapa var. *oleifera*	8
Picris hieracioides japonica	8
Taraxacum officinale	8
Taraxacum platycarpum	8
Solidago virgaurea asiatica	7
Ixeris spp.	7
Taraxacum spp.	7
Erigeron annuus	7
Petasites japonicus	7
Anaphalis margaritaceae marga	7
Capsella bursa-pastoris	6

Sex of the type: Male.
Japanese name: Zumaru-ko-hanabachi.

3. *Lasioglossum (Evylaeus) albipes* (Fabricius, 1781)
Type locality: Italy.
Type depository: Zoologisk Museum Kopenhagen, Denmark (lectotype).
Sex of the type: Male.
Japanese name: Osuaka-ko-hanabachi.

4. *Lasioglossum (Evylaeus) calceatum* (Scopoli, 1763)
Type locality: Unknown.
Type depository: Zoologische Staatssammlung München, Germany (neotype).
Sex of the type: Male.
Japanese name: Takane-ko-hanabachi.

5. *Lasioglossum (Evylaeus) duplex* (Dalla Torre, 1896)
Type locality: Japan (Hokkaido).
Type depository: BMNH.
Sex of the type: Female.
Japanese name: Hokudai-ko-hanabachi.

6. *Lasioglossum (Evylaeus) nipponense* (Hirashima, 1953)
Type locality: Japan (Ehime Pref.).
Type depository: ELKU (according to the original description, the depository of the holotype is indicated as Ehime University, Japan).
Sex of the type: Female.
Japanese name: Nippon-ko-hanabachi.

***latilabrum* species-group**

7. *Lasioglossum (Evylaeus) latilabrum* Murao et Tadauchi, 2006
Type locality: Japan (Ryukyus: Amami-ôshima).
Type depository: ELKU.
Sex of the type: Female.
Japanese name: Ôkuchibiru-ko-hanabachi.

***percrassiceps* species-group**

8. *Lasioglossum (Evylaeus) percrassiceps* (Cockerell, 1931)
Type locality: China.
Type depository: American Museum of Natural History, New York, USA.
Sex of the type: Female.
Japanese name: Ôzu-ko-hanabachi.

***vulsum* species-group**
***hoffmanni* species-subgroup**

9. *Lasioglossum (Evylaeus) hoffmanni* (Strand, 1915)
Type locality: China.
Type depository: DEI (lectotype).
Sex of the type: Female.
Japanese name: Nisekiobi-ko-hanabachi.

10. *Lasioglossum (Evylaeus) naitoi* Ebmer et Maeta, 1994
Type locality: Japan (Ryukyus: Iriomote-jima).
Type depository: MCDS (according to the original description, the depository of holotype is indicated as the ELKU).
Sex of the type: Female.

Japanese name: Naitou-ko-hanabachi.

11. *Lasioglossum (Evylaeus) solisortus* Ebmer et Maeta, 1994

Type locality: Japan (Ryukyus: Iriomote-jima).

Type depository: MCDS (according to the original description, the depository of the holotype is indicated as the ELKU).

Sex of the type: Female.

Japanese name: Akatsuki-ko-hanabachi.

***vulsum* species-subgroup**

12. *Lasioglossum (Evylaeus) baleicum* (Cockerell, 1937)

Type locality: Russian Far East (Siberia).

Type depository: American Museum of Natural History, New York, USA.

Sex of the type: Female.

Japanese name: Shiokawa-ko-hanabachi.

13. *Lasioglossum (Evylaeus) boreale* Svensson, Ebmer et Sakagami, 1977

Type locality: Sweden.

Type depository: Zoological Museum of Uppsala Univ., Uppsala, Sweden.

Sex of the type: Female.

Japanese name: Sugatami-ko-hanabachi.

14. *Lasioglossum (Evylaeus) caliginosum* Murao, Ebmer et Tadauchi, 2006

Type locality: Japan (Hokkaido).

Type depository: ELKU.

Sex of the type: Female.

Japanese name: Yoiyami-ko-hanabachi.

15. *Lasioglossum (Evylaeus) nupricola* Sakagami, 1988

Type locality: Japan (Hokkaido).

Type depository: Systematic Entomology, Faculty of Agriculture, Hokkaido Univ., Sapporo, Japan.

Sex of the type: Female.

Japanese name: Nupri-ko-hanabachi.

16. *Lasioglossum (Evylaeus) sibiriacum* (Blüthgen, 1923)

Type locality: Russian Far East (Siberia).

Type depository: Instytut Zoologiczny Krakow, Poland.

Sex of the type: Female.

Japanese name: Kiobi-ko-hanabachi.

17. *Lasioglossum (Evylaeus) subtropicum* Sakagami, Miyanaga et Maeta, 1994

Type locality: Japan (Ryukyus: Iriomote-jima).

Type depository: ELKU.

Sex of the type: Female.

Japanese name: Iriomote-ko-hanabachi.

18. *Lasioglossum (Evylaeus) vulsum* (Vachal, 1903)

Type locality: Japan.

Type depository: Muséum National d'Histoire Naturelle, Paris, France.

Sex of the type: Male.

Japanese name: Higenaga-ko-hanabachi.

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